

ATLAS OF THE FLORA OF NEW ENGLAND:
PTERIDOPHYTES AND GYMNOSPERMS

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ABSTRACT. Dot maps are provided to depict the distribution at the county level of the pteridophytes (Lycopodiophyta, Equisetophyta, Polypodiophyta) and gymnosperms (Coniferophyta) growing outside of cultivation in the six New England states of the northeastern United States. The 171 taxa (species, subspecies, varieties and hybrids, but not forms) are mapped at the county level based on specimens in the major herbaria of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut, with primary emphasis on the holdings of the New England Botanical Club Herbarium (NEBC). Brief synonymy to account for names used in recent manuals and floras for the area, habitat and chromosome information and common names also are provided.

Key Words: Flora, New England, atlas, distribution, pteridophytes, gymnosperms

This article is the first in a series that will present the distributions of the vascular flora of New England in the form of dot distribution maps at the county level. New England comprises the six northeastern states of the United States: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut. These states range in latitude from 41°N to 47°28'N and in longitude from 67°W to 73°45'W. The elevation of the region extends from sea level to 1,898 m (6,228 ft.) at the summit of Mt. Washington, New Hampshire, the highest mountain in eastern North America outside of North Carolina. The total area of the region is 172,515 km² (66,608 mi.²) including bodies of water; the total land area is 163,157 km² (62,995 mi.²). The effects of continental glaciers, which covered the entire region several times during the Pleistocene, and the last of which did not retreat until about 15,000 years ago, are still clearly evident throughout the area. The state by state statistics on size and elevation are shown in Table 1 (Merriam-Webster, Inc. 1984).

Table 1. Total area, land area, and range in elevation for the six New England states.

	Total Area	Land Area	Elevation Range
Maine	86,028 km ²	80,117 km ²	0–1,606 m
New Hampshire	24,097 km ²	23,395 km ²	0–1,898 m
Vermont	24,887 km ²	24,020 km ²	29–1,339 m
Massachusetts	21,386 km ²	20,287 km ²	0–1,064 m
Rhode Island	3,144 km ²	2,725 km ²	0–248 m
Connecticut	12,973 km ²	12,613 km ²	0–725 m

The more southerly states of Massachusetts, Rhode Island, and Connecticut are densely populated (the least densely populated of these three states, Connecticut, had an average of 262 persons per km² in 1990; Hoffman 1992). The northern states of Maine, New Hampshire, and Vermont are mostly rural (the most densely populated of these three states, New Hampshire, had an average of 48 persons per km² in 1990; Hoffman 1992).

This work encompasses all vascular plants (pteridophytes and spermatophytes) at the rank of species, subspecies, and variety growing outside of cultivation in the New England states. Hybrids also will be included, but forms and other ranks below the level of variety will not. The dots are based primarily on voucher specimens in the herbaria of New England representing reproducing populations, or plants persisting after cultivation when it is uncertain that they are actually naturalized. This first installment includes the pteridophytes (Lycopodiophyta, Equisetophyta, Polypodiophyta) and gymnosperms (Coniferophyta). Future accounts will treat the distribution of angiosperms.

We intend to gather this series of articles, together with additional background material, into a separate volume upon completion of all the maps, and to make it available on the World Wide Web as various parts are finished. It is our hope that, in the meantime, these articles will stimulate additional field work to supplement the distributions portrayed in the maps. The New England Botanical Club herbarium, which has proven to be the most important resource for this project, is especially eager to receive specimens documenting range extensions. We also would like to be informed of such specimens in other herbaria. Similarly, because the atlas of the New England flora will be continuously updated as new information becomes available, we are eager to receive notification of published corrections of cytological infor-

mation and new, documented chromosome counts for taxa in the New England flora.

MATERIALS AND METHODS

This atlas grew out of an inventory of the New England Botanical Club vascular plant herbarium. The purpose of the inventory, conducted at the county level, was to serve as a filter for the processing of a large number of unmounted specimens being considered for accession. Consequently, the core of the database for this atlas consists of specimens in the herbarium of vascular plants of the New England Botanical Club (NEBC). The NEBC herbarium, which limits its geographical scope to the New England states, presently comprises more than 251,000 specimens and is the largest collection of plants for the New England region.

In the mid 1980s the herbarium inventory was expanded into an atlas project, since data from the NEBC herbarium essentially depict the distributions of the vascular plants of New England. Additional data from specimens in other major herbaria with large holdings of New England plants have allowed us to portray the distributions more completely.

The data represented currently by specimens in New England herbaria best depict vascular plant distributions when displayed at the county level. Attempting to display such data by the exact geographical coordinates of each collection locality, or even at the township level, distorts the actual distributions. By such detailed mapping, patterns tend to reflect concentrated collecting along major highways and clustering near popular resort areas or botanical hot spots. This was evident from some of the detailed distribution maps produced about 15 years ago by the plant distribution committee (now defunct) of the New England Botanical Club. The distortions portrayed by such detailed mapping are resolved by using data only at the county level.

The counties of New England range in size from Bristol County, Rhode Island (65 km², or 25 mi.²), to Aroostook County, Maine (17,666 km², or 6821 mi.²—land only). The great majority of counties, however, are between 1300 km² (500 mi.²) and 3900 km² (1500 mi.²). To reduce the size disparity at the large end, and to depict distributions more evenly, the largest Maine counties are subdivided. Penobscot, Piscataquis, Somerset, and Oxford Counties are divided arbitrarily into roughly equal-sized, north and

south sectors along township boundaries. Aroostook County, the largest county, is divided into three sectors. Coös County, New Hampshire, is divided into north and south sectors. The division of Coös County isolates the White Mountains, which harbor an alpine flora associated mostly with New England's highest peak, Mount Washington. Figure 1 shows the location of states and counties of New England and the subdivisions of the largest counties.

Data were collected primarily from herbarium specimens of major herbaria in New England. The herbaria used to compile data for this work were those of the New England Botanical Club (NEBC), Harvard University (A, AMES, GH), University of Maine (MAINE), University of Massachusetts (MASS), University of New Hampshire (NHA), University of Rhode Island (KIRI), University of Vermont (VT), and Brown University (BRU). Records from the herbaria at the University of Connecticut (CONN), Connecticut Botanical Society (NCBS), and Yale University (YU) were accessed from data compiled by Leslie Mehrhoff. Lastly, the notebooks of Harry Ahles at the University of Massachusetts were consulted. Ahles visited these same herbaria, plus one or two others, in the 1960s and 1970s to gather locality information at the county level. We obtained some records from systematic treatments where the information on voucher specimens was specific enough to provide county data and the name of the herbarium where the specimens were deposited.

In recording the collection data no attempt was made to verify the accuracy of the identification of every specimen, but obvious misidentifications were annotated with corrections. Even though the basis for a particular dot might be a misidentified specimen, for plants common within New England, our view is that the taxon most likely occurs within the county. Specimens documenting disjunct or marginal occurrences (or otherwise rare, endangered or threatened taxa) usually have received greater scrutiny, because of a heightened interest in rare plants nationwide, and are less likely to be misidentified.

The data were entered into a simple computer database using one of several letters in the county field as a code to indicate the herbarium in which the voucher specimen is deposited. The letter code indicates the first herbarium where a voucher specimen was seen. No letter codes were added for subsequent voucher specimens at other herbaria, because our primary objective has been to plot the distribution of the taxon, not to inventory the holdings

of any particular herbarium. While such information might be of value for some purposes, we felt that our time at other herbaria was best devoted to searching for data not found in the New England Botanical Club herbarium, or in each subsequently searched herbarium, to fill in gaps in distribution.

The data in the database were converted to dot distribution maps using a method devised by Angelo (1994). A more detailed and technical description of the mapping methodology will appear as an appendix in the final volume. Interested parties may obtain a draft of the appendix upon request to the first author.

TAXONOMY AND FORMAT

The taxonomy and nomenclature adopted for this work essentially follow the *Flora of North America* (Flora of North America Editorial Committee 1993). With the exception of the arrangement for the major divisions within the pteridophytes (Lycopodiophyta, Equisetophyta, and Polypodiophyta), which follows the *Flora of North America* (Flora of North America Editorial Committee 1993) sequence, the families are ordered alphabetically. The genera are alphabetical within families, as are species within genera. Named and unnamed hybrid taxa are placed alphabetically at the end of the genus. Unnamed hybrids combine the names of the progenitors alphabetically by epithet.

Species deemed to be introduced, that is, not native in New England at the time of European contact with North America, are indicated by the use of all upper case type for the scientific name. No single source of information was used in determining introduced species. For most taxa there is little dispute as to nativity. Where differences of opinion exist in the literature, we have used our own judgment based on the evidence available.

A common name is supplied when it appears to be a name in general use. Names used in New England have been given preference.

Cited chromosome numbers are taken from indices prepared by Cave (1958a, 1958b, 1959a, 1959b, 1960, 1961, 1962, 1963, 1964, 1965), Goldblatt (1981, 1984, 1985, 1988), Goldblatt and Johnson (1990, 1991, 1994), Moore (1973, 1974, 1977), Ornduff (1967, 1968, 1969), and reports by Takamiya and Kurita (1983), Taylor (1970), Tryon (1978), Tryon and Tryon (1982), and Wagner (1971). Very few of the counts are based on material from

New England, but instead reflect counts made from throughout the range of the taxon.

The habitat data are distillations from a variety of sources augmented by our own field observations. An attempt was made to indicate habitat information as it applies to a particular taxon in New England rather than to the entire range of the taxon.

Synonymy is provided primarily with respect to names used in the standard manuals covering New England published from 1950 onward, including Fernald (1950), Gleason (1952), Gleason and Cronquist (1963, 1991), and Seymour (1969a, 1982).

A selection of references, including many not cited above, is provided. This list consists of the standard manuals published from 1950 to date, regional and county floras and checklists produced after 1950, and what we believe to be the key articles and books on the pteridophytes and gymnosperms pertinent to New England. We would appreciate being notified of papers we may have overlooked.

LYCOPODIOPHYTA

ISOËTACEAE

Isoëtes acadiensis Kott—Acadian Quillwort (Figure 2). $2n = 44$; the report of $2n = 44$ (Kott and Britton 1980) for *I. macrospora* Durieu forma *hieroglyphica* (A. A. Eaton) N. E. Pfeiffer was later attributed (Kott 1981) to *I. acadiensis*. Shallow water of ponds and slow moving streams.

Isoëtes echinospora Durieu—Braun's Quillwort (Figure 2). $2n = 22, 33$. Shallow water and shores of slightly acidic lakes, ponds, and streams. [*I. echinospora* var. *braunii* (Durieu) Engelman; *I. echinospora* var. *muricata* (Durieu) Engelman; *I. muricata* Durieu]

Isoëtes engelmannii A. Braun—Engelmann's Quillwort (Figure 2). $n = 11$; $2n = 22$. Shallow water of ponds, lakes, streams, or in muddy ditches.

Isoëtes lacustris Linnaeus—Lake Quillwort (Figure 2). $2n = 110$. Shores and shallow water of slightly acidic ponds, lakes, and streams. [*I. macrospora* Durieu; *I. hieroglyphica* A. A. Eaton]

Isoëtes prototypus D. M. Britton (Figure 3). $2n = 22$. Deep water of cold, acidic lakes.

Isoëtes riparia Engelmann ex A. Braun—Riverbank Quillwort (Figure 3). $2n = 44$. Muddy or sandy shores (including tidal shores and estuaries), usually of rivers. [*I. riparia* var. *canadensis* Engelmann; *I. saccharata* Engelmann var. *amesii* A. A. Eaton]

Isoëtes tuckermanii A. Braun ex Engelmann—Tuckerman's Quillwort (Figure 3). $2n = 44$. Pond and lake margins, shores (frequently tidal), usually submersed in quiet water.

—*Isoëtes* Hybrids—

Isoëtes $\times$ *eatonii* Dodge (Figure 3). [= *I. echinospora* Durieu $\times$ *I. engelmannii* A. Braun; *I. \times gravesii* A. A. Eaton; *I. eatonii* Dodge var. *gravesii* (A. A. Eaton) Clute]

Isoëtes $\times$ *harveyi* A. A. Eaton. This hybrid was recognized only recently by Britton (1991). Herbarium specimens annotated as this hybrid are from southern Penobscot Co., Maine (US); Somerset Co., Maine (MAINE); and Mt. Desert Island, Maine (MO). Since the holdings of NEBC have not been examined critically for this hybrid, it is not mapped. [= *I. lacustris* Linnaeus $\times$ *I. tuckermanii* A. Braun]

LYCOPODIACEAE

Diphasiastrum complanatum (Linnaeus) Holub—Northern Running Pine (Figure 4). $n = 22-24, 23$; $2n = 40, 44, 46, 48$. Dry, open coniferous or mixed forests. [*Lycopodium complanatum* Linnaeus]

Diphasiastrum digitatum (Dillenius ex A. Braun) Holub—Southern Running Pine (Figure 4). $n = 23$; $2n = 46$. Usually dry woods, thickets, or open fields, in acid soils. [*Lycopodium complanatum* Linnaeus var. *flabelliforme* Fernald]

Diphasiastrum sitchense (Ruprecht) Holub—Sitka Clubmoss (Figure 4). $n = 23$; $2n = 46$. Alpine meadows, open rocky

barrens, conifer woods (rarely). [*Lycopodium sitchense* Ruprecht]

Diphasiastrum tristachyum (Pursh) Holub—Ground Cedar (Figure 4). $n = 23$; $2n = 46$. Acid soils in open conifer or oak woods, thickets. [*Lycopodium tristachyum* Pursh]

—*Diphasiastrum* Hybrids—

Diphasiastrum alpinum (Linnaeus) Holub $\times$ *Diphasiastrum complanatum* (Linnaeus) Holub (Figure 5).

Diphasiastrum complanatum (Linnaeus) Holub $\times$ *Diphasiastrum digitatum* (Dillenius ex A. Braun) Holub (Figure 5).

Diphasiastrum digitatum (Dillenius ex A. Braun) Holub $\times$ *Diphasiastrum* $\times$ *sabinifolium* (Willdenow) Holub (Figure 5).

Diphasiastrum $\times$ *habereri* (House) Holub (Figure 5). [= *D. digitatum* (Dillenius ex A. Braun) Holub $\times$ *D. tristachyum* (Pursh) Holub; *Lycopodium* $\times$ *habereri* House]

Diphasiastrum $\times$ *issleri* (Rouy) Holub (Figure 6). [= *D. alpinum* (Linnaeus) Holub $\times$ *D. tristachyum* (Pursh) Holub; *Lycopodium* $\times$ *issleri* (Rouy) Lawalr  e]

Diphasiastrum $\times$ *sabinifolium* (Willdenow) Holub—Savin-leaved Clubmoss (Figure 6). $2n = 46$. Woods (often subalpine spruce), thickets, clearings. [= *D. sitchense* (Ruprecht) Holub $\times$ *D. tristachyum* (Pursh) Holub; *Lycopodium sabinifolium* Willdenow]

Diphasiastrum $\times$ *zeilleri* (Rouy) Holub (Figure 6). [= *D. complanatum* (Linnaeus) Holub $\times$ *D. tristachyum* (Pursh) Holub]

Huperzia appalachiana Beitel & Mickel (Figure 6). Cliffs, talus slopes, damp, acidic rocks in alpine zones. [Specimens mapped are from the herbaria of the New England Botanical Club and Harvard University.]

Huperzia lucidula (Michaux) Trevisan—Shining Clubmoss (Figure 7). $n = 67$; $2n = 134$. Cool, moist woods in rich and acid soils. [*Lycopodium lucidulum* Michaux]

Huperzia selago (Linnaeus) Bernhardt ex Schrank & Martius—Mountain Clubmoss (Figure 7). $n = 136\text{II}$; $2n = 268$. Damp rocks, barrens, cold woods, in mountainous regions. [*H. selago* var. *densa* Trevisan; *Lycopodium selago* Linnaeus; *Lycopodium selago* Linnaeus var. *appressum* Desvaux]

—*Huperzia* Hybrids—

Huperzia appalachiana Beitel & Mickel $\times$ *Huperzia lucidula* (Michaux) Trevisan (Figure 7).

Huperzia appalachiana Beitel & Mickel $\times$ *Huperzia selago* (Linnaeus) Bernhardt ex Schrank & Martius (Figure 7).

Huperzia $\times$ *buttersii* (Abbe) Kartesz & Gandhi (Figure 8). [= *H. lucidula* (Michaux) Trevisan $\times$ *H. selago* (Linnaeus) Bernhardt ex Schrank & Martius]

Lycopodiella alopecuroides (Linnaeus) Cranfill—Foxtail Clubmoss (Figure 8). $2n = 156$. Bogs, marshes, ditches, sandy or peaty shores, wet barrens, in acid soils. [*Lycopodium alopecuroides* Linnaeus]

Lycopodiella appressa (Chapman) Cranfill—Appressed Bog Clubmoss (Figure 8). $2n = 156$. Damp, acid or peaty soils in the open. [*Lycopodium appressum* (Chapman) Lloyd & Underwood; *Lycopodium inundatum* Linnaeus var. *bigelovii* Tuckerman; *Lycopodium inundatum* Linnaeus var. *robustum* R. J. Eaton]

Lycopodiella inundata (Linnaeus) Holub—Bog Clubmoss (Figure 8). $n = 78$; $2n = 156$. Damp, acid, sandy or peaty soils in the open. [*Lycopodium inundatum* Linnaeus]

Lycopodiella margueritae J. G. Bruce, W. H. Wagner & Beitel (Figure 9). $2n = 312$.

Lycopodium annotinum Linnaeus—Stiff Clubmoss (Figure 9). $n = 34, 68\text{II}$; $2n = \text{ca. } 50, 66, 68$. Woods, cool shaded thickets, exposed rocky or peaty habitats at higher elevations. [*L. annotinum* var. *acrifolium* Fernald; *L. annotinum* var. *alpestre* C. Hartman; *L. annotinum* var. *pungens* (Bachelot de la Py-laie) Desvaux]

Lycopodium clavatum Linnaeus—Staghorn Clubmoss (Figure 9). $n = 22, 34, 34\text{II}, 34\text{III}, 34\text{IV}, 68 (69, 70)$; $2n = 34, 44, 68, 102, 136$. Open, usually dry, woods and thickets, clearings, exposed rocky situations, in acid soils. [*L. clavatum* var. *subremotum* Victorin]

Lycopodium dendroideum Michaux—Tree Clubmoss (Figure 9). $2n = 68$. Dry, open woods and clearings. [*L. obscurum* Linnaeus var. *dendroideum* (Michaux) D. C. Eaton]

Lycopodium hickeyi W. H. Wagner, Beitel & R. C. Moran—Hickey's Clubmoss (Figure 10). $2n = 68$. Mainly deciduous woods and thickets, usually in acid soils. [*L. obscurum* Linnaeus var. *isophyllum* Hickey]

Lycopodium lagopus (Laestadius ex C. Hartman) G. Zinserling ex Kuzeneva-Prochorova (Figure 10). $2n = 68$. Grassy fields and openings in second-growth woods. [*L. clavatum* Linnaeus var. *megastachyon* Fernald & Bissell; *L. clavatum* Linnaeus var. *monostachyon* Hooker & Greville] Distribution data are primarily from the herbaria of the New England Botanical Club and Harvard University.

Lycopodium obscurum Linnaeus—Tree Clubmoss (Figure 10). $n = 34, 34\text{II}$; $2n = 68$. Rich woods, clearings, edges of boggy forests, usually in acid soils.

—*Lycopodium* Hybrids—

Lycopodium dendroideum Michaux $\times$ *Lycopodium obscurum* Linnaeus (Figure 10).

Pseudolycopodiella caroliniana (Linnaeus) Holub—Carolina Clubmoss (Figure 11). $n = 35, 68, 70, 115$; $2n = 70, 78, 140$.

Damp, open sands and peat in acid soils. [*Lycopodium carolinianum* Linnaeus]

SELAGINELLACEAE

Selaginella apoda (Linnaeus) Spring—Meadow Spikemoss (Figure 11). $2n = 18$. Meadows, stream banks, moist lawns, wet rocks, often in circumneutral soils. [*S. eclipses* W. R. Buck]

Selaginella rupestris (Linnaeus) Spring—Rock Spikemoss (Figure 11). $2n = 18$. Exposed, dry rocks or packed sands.

Selaginella selaginoides (Linnaeus) Palisot de Beauvois ex Martius & Schrank—Northern Spikemoss (Figure 11). $2n = 18$. Damp shores and banks, bogs, springs, often calcareous.

EQUISETOPHYTA

EQUISETACEAE

Equisetum arvense Linnaeus—Field Horsetail (Figure 12). $n = 108$; $2n = 200+$, 216. Open, low ground, roadsides, damp, open woods and thickets. [*E. arvense* var. *boreale* (Bongard) Ruprecht]

Equisetum fluviatile Linnaeus—Water Horsetail (Figure 12). $n = 108$; $2n = 216$. Shores, shallow water of pond and river margins, swales.

Equisetum hyemale Linnaeus subsp. *affine* (Engelmann) Calder & Roy L. Taylor—Common Scouring Rush (Figure 12). $n = 108$. Sandy banks and shores, alluvium, moist wooded slopes, roadsides. [*E. hyemale* var. *affine* (Engelmann) A. A. Eaton; *E. hyemale* var. *pseudohyemale* (Farwell) C. V. Morton]

Equisetum palustre Linnaeus—Marsh Horsetail (Figure 12). $n = 108$. Shores, flooded meadows, swamps, and marshes.

Equisetum pratense Ehrhart—Meadow Horsetail (Figure 13). $n = 108$; $2n = 216$. Rich slopes in humus-rich neutral soils, meadows, alluvial thickets.

Equisetum scirpoides Michaux—Dwarf Scouring Rush (Figure 13). $n = 108$. Well-drained slopes, in cool woods, frequently under *Tsuga*, often growing in moss.

Equisetum sylvaticum Linnaeus—Wood Horsetail (Figure 13). $2n = 216$. Cool moist woods, swamps, around springs. [*E. sylvaticum* var. *pauciramosum* Milde]

Equisetum variegatum Schleicher ex F. Weber & D. Mohr—Variegated Horsetail (Figure 13). $2n = 216$. Riverbanks, shores, bog margins, moist gravel, and damp, calcareous sands.

—*Equisetum* Hybrids—

Equisetum $\times$ *ferrissii* Clute (Figure 14). Sandy shores, embankments, roadsides. [= *E. hyemale* Linnaeus $\times$ *E. laevigatum* A. Braun; *E. hyemale* Linnaeus var. *intermedium* A. A. Eaton; *E. hyemale* Linnaeus var. *elatum* (Engelmann) C. V. Morton]

Equisetum $\times$ *litorale* Kuhlewein ex Ruprecht—Shore Horsetail (Figure 14). Shores, ditches, meadows. [= *E. arvense* Linnaeus $\times$ *E. fluviatile* Linnaeus]

Equisetum $\times$ *mackaii* (Newman) Brichan (Figure 14). $2n = 432$. Riverbanks, shores, bog margins, gravelly areas, damp, calcareous sands. [= *E. hyemale* Linnaeus $\times$ *E. variegatum* Schleicher ex F. Weber & D. Mohr; *E.* $\times$ *trachyodon* (A. Braun) Koch; *E. variegatum* Schleicher ex F. Weber & D. Mohr var. *jesupii* A. A. Eaton]

POLYPODIOPHYTA

ASPLENIACEAE

Asplenium montanum Willdenow—Mountain Spleenwort (Figure 14). $2n = 72$. Moist, sheltered crevices of chiefly non-calcareous cliffs and ledges.

Asplenium platyneuron (Linnaeus) Britton, Sterns & Poggenburg—Ebony Spleenwort (Figure 15). $n = 36, 36\text{II}$. Well-drained, rocky, circumneutral soils on slopes and ledges in deciduous forests (occasionally on crumbling mortar). [*A. platyneuron* var. *incisum* (E. C. Howe) B. L. Robinson]

Asplenium rhizophyllum Linnaeus—Walking Fern (Figure 15). $n = 36$. Shaded, basic or circumneutral rocks, rarely on earth or at tree bases. [*Camptosorus rhizophyllum* (Linnaeus) Link]

Asplenium ruta-muraria Linnaeus—Wall-rue (Figure 15). $n = 36, 72; 2n = 144$. Shaded crevices of calcareous cliffs and ledges. [*A. cryptolepis* Fernald; *A. ruta-muraria* var. *cryptolepis* (Fernald) Wherry]

Asplenium trichomanes Linnaeus—Maidenhair Spleenwort (Figure 15). $n = 36, 36\text{II}, 36\text{II} + 36\text{I}, 72, 81, 108, 144; 2n = 72, 144, \text{ca. } 216$. Shaded crevices of mainly calcareous rocks (occasionally on crumbling mortar). [*A. trichomanes* subsp. *quadrivalens* D. E. Meyer]

Asplenium trichomanes-ramosum Linnaeus—Green Spleenwort (Figure 16). $n = 36; 2n = 72$. Shaded, moist crevices and talus of calcareous and serpentine rocks and outcrops. [*A. viride* Hudson]

—*Asplenium* Hybrids—

Asplenium $\times$ *clermontae* Syme (Figure 16). $3x = 108$. [= *A. ruta-muraria* Linnaeus $\times$ *A. trichomanes* Linnaeus]

Asplenium $\times$ *ebenoides* R. R. Scott—Scott's Spleenwort (Figure 16). $2n = 72, 144$. [= *A. platyneuron* (Linnaeus) Britton, Sterns & Poggenburg $\times$ *A. rhizophyllum* Linnaeus; $\times$ *Asplenosorus ebenoides* (R. R. Scott) Wherry]

AZOLLACEAE

AZOLLA CAROLINIANA Willdenow—Mosquito Fern (Figure 16). $n = 48; 2n = 44, 66$. Floating in quiet waters. From south of our range.

BLECHNACEAE

Woodwardia areolata (Linnaeus) T. Moore—Netted Chain Fern (Figure 17). $n = 35$. Swamps and boggy woods in acid soils.

Woodwardia virginica (Linnaeus) Smith—Virginia Chain Fern (Figure 17). $n = 35$, ca. 36. Acid swamps, bogs, and wet, wooded bottoms.

DENNSTAEDTIACEAE

Dennstaedtia punctilobula (Michaux) T. Moore—Hay-scented Fern (Figure 17). $n =$ ca. 33, 34. Open woods, roadsides, stream banks, pastures and rocky slopes in sterile soils.

Pteridium aquilinum (Linnaeus) Kuhn subsp. *latiusculum* (Desvaux) Hultén—Bracken (Figure 17). $n = 52$; $2n = 104$. Clearings, pastures, burns, thickets and woods, usually in dry, sterile soils. [*P. aquilinum* var. *latiusculum* (Desvaux) L. Underwood ex A. Heller]

Pteridium aquilinum (Linnaeus) Kuhn subsp. *pseudocaudatum* (Clute) Hultén—Bracken (Figure 18). Same habitats as in subsp. *latiusculum*. [*P. aquilinum* var. *pseudocaudatum* (Clute) A. Heller]

DRYOPTERIDACEAE

Athyrium filix-femina (Linnaeus) Roth ex Mertens subsp. *angustum* (Willdenow) R. T. Clausen—Lady Fern (Figure 18). $n = 40$; $2n = 80$. Moist woods, thickets, ravines, fields, meadows and swamps. [*A. filix-femina* var. *angustum* (Willdenow) G. Lawson; *A. filix-femina* var. *michauxii* (Sprengel) Farwell]

Athyrium filix-femina (Linnaeus) Roth ex Mertens subsp. *asplenioides* (Michaux) Hultén—Southern Lady Fern (Figure 18). $2n = 80$. Moist woods, thickets, swamps, meadows. [*A. filix-femina* var. *asplenioides* (Michaux) Farwell]

Cystopteris bulbifera (Linnaeus) Bernhardt—Bulblet Fern (Figure 18). $n = 42$; $2n = 42$. Calcareous, usually moist, ledges, steep banks, rocky slopes, and ravines.

Cystopteris fragilis (Linnaeus) Bernhardt—Fragile Fern (Figure 19). $n = 42, 84, 126$; $2n = 168$. Moist rocks, rocky (mostly wooded) slopes.

Cystopteris laurentiana (Weatherby) Blasdel. $n = 126$; $2n = 252$. Cliffs, often calcareous. [*C. fragilis* (Linnaeus) Bernhardt var. *laurentiana* Weatherby] Distribution data were not collected for this taxon, since it was generally not distinguished from *C. fragilis* (Linnaeus) Bernhardt in New England herbaria.

Cystopteris protrusa (Weatherby) Blasdel—Southern Bladder Fern (Figure 19). $n = 42, 63$. Moist, often calcareous, wooded slopes, rocky banks, and alluvium. [*C. fragilis* (Linnaeus) Bernhardt var. *protrusa* Weatherby]

Cystopteris tenuis (Michaux) Desvaux—Mackay's Fragile Fern (Figure 19). $n = 84$; $2n = 168$. Moist, shaded rocks, rocky (mostly wooded) slopes, alluvium, open woods. [*C. fragilis* (Linnaeus) Bernhardt var. *mackayi* G. Lawson]

—*Cystopteris* Hybrids—

Cystopteris fragilis (Linnaeus) Bernhardt $\times$ *Cystopteris tenuis* (Michaux) Desvaux (Figure 19). $n = 53\text{II} + 60\text{I} + 2\text{III}$, $53\text{I} + 56\text{I} + 2\text{III}$, $52\text{I} + 64\text{I}$. Dry to moist cliffs and talus, moist ravines. Information for this hybrid is from Paller and Barrington (1995).

Deparia acrostichoides (Swartz) M. Kato—Silvery Spleenwort (Figure 20). $n = 40$; $2n = 80$. Rich moist woods, bottomlands, shaded slopes. [*Athyrium thelypteroides* (Michaux) Desvaux; *Diplazium acrostichoides* (Swartz) Butters]

Diplazium pycnocarpon (Sprengel) M. Broun—Narrow-leaved Spleenwort (Figure 20). $n = 40$. Moist, mostly calcareous, wooded slopes, ravines, and bottoms. [*Athyrium pycnocarpon* (Sprengel) Tidestrom; *Homalosorus pycnocarpos* (Sprengel) Small ex Pichi-Sermolli]

Dryopteris campyloptera (Kunze) Clarkson—Mountain Wood Fern (Figure 20). $n = 82$; $2n = 164$. Moist, cool woods, thickets, and banks. [*D. austriaca* (Jacquin) Woyнар ex Schinz & Thellung var. *austriaca*; *D. spinulosa* (O. F. Mueller) Watt var. *americana* (Fischer ex Kunze) Fernald; *D. spinulosa* (O. F. Mueller) Watt var. *concordiana* (Davenport) Eastman; *D. austriaca* (Jacquin) Woyнар ex Schinz & Thellung var. *concordiana* (Davenport) Morton]

Dryopteris carthusiana (Villars) H. P. Fuchs—Spinulose Wood Fern (Figure 20). $n = 82$; $2n = \text{ca. } 160, 164$. Low, moist (occasionally dry) woods and thickets, stream banks, swamps. [*D. austriaca* (Jacquin) Woyнар ex Schinz & Thellung var. *spinulosa* (O. F. Mueller) Fiori; *D. spinulosa* (O. F. Mueller) Watt]

Dryopteris cristata (Linnaeus) A. Gray—Crested Wood Fern (Figure 21). $n = 41, 82, 123$; $2n = 82, 164$. Swamps, wet woods, marshes, boggy thickets.

Dryopteris filix-mas (Linnaeus) Schott—Male Fern (Figure 21). $n = 82, 83$; $2n = 41, 164$. Rocky wooded slopes, cold ravines, rich woods, upland pastures in chiefly calcareous soil, trap, or slate.

Dryopteris fragrans (Linnaeus) Schott—Fragrant Cliff Fern (Figure 21). $n = 41, 42$. Dry, often north-facing and calcareous, cliffs, ledges, talus, and rocky banks. [*D. fragrans* var. *remotiuscula* Komarov]

Dryopteris goldiana (Hooker ex Goldie) A. Gray—Goldie's Fern (Figure 21). $n = 41$; $2n = 41$. Rich, moist woods, rocky slopes (mostly calcareous), ravines.

Dryopteris intermedia (Muhlenberg ex Willdenow) A. Gray—Glandular Wood Fern (Figure 22). $n = 41$; $2n = 82$. Moist, rocky woods and moist thickets. [*D. austriaca* (Jacquin) Woyнар ex Schinz & Thellung var. *intermedia* (Muhlenberg ex Willdenow) C. V. Morton; *D. spinulosa* (O. F. Mueller) Watt var. *intermedia* (Muhlenberg ex Willdenow) L. Underwood]

Dryopteris marginalis (Linnaeus) A. Gray—Marginal Shield Fern (Figure 22). $n = 41$. Rocky, usually rich, wooded slopes, ravines.

—*Dryopteris* Hybrids—

Dryopteris × *benedictii* Wherry (Figure 22). [= *D. carthusiana* (Villars) H. P. Fuchs × *D. × clintoniana* (D. C. Eaton) Dowell]

Dryopteris × *boottii* (Tuckerman) Underwood—Boott's Wood Fern (Figure 22). $n = 82, 123$; $2n = 123$. Moist woods and thickets in mildly acid soils. [= *D. cristata* (Linnaeus) A. Gray × *D. intermedia* (Willdenow) A. Gray]. This common and widespread hybrid is not treated in *Flora of North America* (Flora of North America Editorial Committee 1993).

Dryopteris × *burgessii* Boivin (Figure 23). [= *D. × clintoniana* (D. C. Eaton) Dowell × *D. marginalis* (Linnaeus) A. Gray]

Dryopteris campyloptera (Kunze) Clarkson × *Dryopteris intermedia* (Muhlenberg ex Willdenow) A. Gray (Figure 23).

Dryopteris campyloptera (Kunze) Clarkson × *Dryopteris marginalis* (Linnaeus) A. Gray (Figure 23).

Dryopteris carthusiana (Villars) H. P. Fuchs × *Dryopteris goldiana* (Hooker ex Goldie) A. Gray (Figure 23). There is one known collection for this taxon. Other collections so identified are variations of *D. goldiana* (report in preparation, W. H. Wagner, Jr., pers. comm.).

Dryopteris × *clintoniana* (D. C. Eaton) Dowell—Clinton's Wood Fern (Figure 24). $n = 123$; $2n = 246$. Wet (rarely only moist), often circumneutral woods and swamps. [= *D. cristata* (Linnaeus) A. Gray × *D. goldiana* (Hooker ex Goldie) A. Gray; *D. cristata* (Linnaeus) A. Gray var. *clintoniana* (D. C. Eaton) L. Underwood]

Dryopteris × *clintoniana* (D. C. Eaton) Dowell × *Dryopteris cristata* (Linnaeus) A. Gray (Figure 24).

Dryopteris × *clintoniana* (D. C. Eaton) Dowell × *Dryopteris filix-mas* (Linnaeus) Schott (Figure 24).

Dryopteris × *clintoniana* (D. C. Eaton) Dowell × *Dryopteris goldiana* (Hooker ex Goldie) A. Gray (Figure 24).

Dryopteris × *dowellii* (Farwell) Wherry (Figure 25). [= *D.* × *clintoniana* (D. C. Eaton) Dowell × *D. intermedia* (Muhlenberg ex Willdenow) A. Gray]

Dryopteris filix-mas (Linnaeus) Schott × *Dryopteris marginalis* (Linnaeus) A. Gray (Figure 25).

Dryopteris goldiana (Hooker ex Goldie) A. Gray × *Dryopteris intermedia* (Muhlenberg ex Willdenow) A. Gray (Figure 25).

Dryopteris intermedia (Muhlenberg ex Willdenow) A. Gray × *Dryopteris marginalis* (Linnaeus) A. Gray (Figure 25).

Dryopteris × *neowherryi* W. H. Wagner (Figure 26). [= *D. goldiana* (Hooker ex Goldie) A. Gray × *D. marginalis* (Linnaeus) A. Gray]

Dryopteris × *pittsfordensis* Slosson (Figure 26). [= *D. carthusiana* (Villars) H. P. Fuchs × *D. marginalis* (Linnaeus) A. Gray]

Dryopteris × *slossoniae* Wherry ex Lellinger (Figure 26). [= *D. cristata* (Linnaeus) A. Gray × *D. marginalis* (Linnaeus) A. Gray]

Dryopteris × *triploidea* Wherry (Figure 26). $3n = 123$. Rocky or swampy (often rich) woods. [= *D. carthusiana* (Villars) H. P. Fuchs × *D. intermedia* (Muhlenberg ex Willdenow) A. Gray; *D. austriaca* (Jacquin) Woyнар ex Schinz & Thellung var. *fructuosa* (Gilbert) C. V. Morton; *D. spinulosa* (O. F. Mueller) Watt var. *fructuosa* (Gilbert) Trudell]. This common and widespread hybrid is not treated in *Flora of North America* (Flora of North America Editorial Committee 1993).

Dryopteris × *uliginosa* (A. Braun ex Dowell) Druce (Figure 27). [= *D. carthusiana* (Villars) H. P. Fuchs × *D. cristata* (Linnaeus) A. Gray]

Gymnocarpium dryopteris (Linnaeus) Newman—Oak Fern (Figure 27). $n = 40$, ca. 73, 80; $2n = 80$, 160. Cool, moist, often rocky, woods and banks. [*Dryopteris disjuncta* (Ruprecht) C. V. Morton (misapplied)]

Gymnocarpium jessoense (Koidzumi) Koidzumi subsp. *parvulum* Sarvela—Nahanni Oak Fern (Figure 27). $2n = 80, 160$. Acid or neutral substrates of cool talus slopes, cliffs, and outcrops. This taxon also is reported to occur in Connecticut in *Flora of North America* (Flora of North America Editorial Committee 1993), but neither specimens nor specific citations of specimens in the literature have been seen. Kathleen Pryer (pers. comm.) indicates that the Connecticut report may be based on a mislabeled specimen.

Matteuccia struthiopteris (Linnaeus) Todaro—Ostrich Fern (Figure 27). $n = 39, 40$; $2n = 78$. Alluvium, bottomland thickets, swamps, and moist woods, often in circumneutral soils. [*M. pensylvanica* (Willdenow) Raymond; *M. struthiopteris* var. *pensylvanica* (Willdenow) C. V. Morton; *Pteretis pensylvanica* (Willdenow) Fernald]

Onoclea sensibilis Linnaeus—Sensitive Fern (Figure 28). $n = 37$; $2n = 74$. Swamps, low woods, alluvial thickets, meadows, in neutral to slightly acid soils. [*O. sensibilis* var. *obtusilobata* (Schkuhr) Torrey]

Polystichum acrostichoides (Michaux) Schott—Christmas Fern (Figure 28). $n = 41$; $2n = 82$. Rocky woods and slopes, occasionally swamps.

Polystichum braunii (Spenner) Fée—Braun's Holly Fern (Figure 28). $n = 82$; $2n = 164$. Cool, damp, rocky woods, ravines, and banks in circumneutral soils. [*P. braunii* var. *purshii* Fernald; *P. braunii* subsp. *purshii* (Fernald) Calder & Roy L. Taylor]

—*Polystichum* Hybrids—

Polystichum $\times$ *potteri* Barrington (Figure 28). $n = 71\text{I} + 26\text{II}$, $74\text{I} + 23\text{II} + 1\text{III}$, $77\text{I} + 23\text{II}$, $79\text{I} + 22\text{II}$, $81\text{I} + 21\text{II}$, $85\text{I} + 19\text{II}$, $87\text{I} + 18\text{II}$. [= *P. acrostichoides* (Michaux) Schott $\times$ *P. braunii* (Spenner) Fée]

Woodsia alpina (Bolton) S. F. Gray—Northern Woodsia (Figure 29). $n = 82$; $2n = 156, 164$. Cool, calcareous (sometimes slaty) rock crevices. [*W. alpina* var. *bellii* Lawson]

Woodsia glabella R. Brown ex Richardson—Smooth Woodsia (Figure 29). $n = 39$, ca. 40, ca. 82; $2n = 78$, ca. 80. Moist, shaded crevices of calcareous rocks.

Woodsia ilvensis (Linnaeus) R. Brown—Rusty Woodsia (Figure 29). $n = 39, 41$; $2n = 78, 82$. Dry, often exposed, cliffs and talus.

Woodsia obtusa (Sprengel) Torrey—Blunt-lobed Woodsia (Figure 29). $n = 76$. Shaded ledges and rocky woods, mostly in calcareous soils.

—*Woodsia* Hybrids—

Woodsia $\times$ *gracilis* (Lawson) Butters (Figure 30). [= *W. alpina* (Bolton) S. F. Gray $\times$ *W. ilvensis* (Linnaeus) R. Brown]

HYMENOPHYLLACEAE

Trichomanes intricatum Farrar—Appalachian Bristle Fern (Figure 30). Sheltered, moist, noncalcareous rock crevices and other protected places in deep ravines and gorges. Known only as gametophytes.

LYGODIACEAE

Lygodium palmatum (Bernhardi) Swartz—Climbing Fern (Figure 30). $n = 30$. Damp thickets and woods, stream banks, in acid soils.

MARSILEACEAE

MARSILEA QUADRIFOLIA Linnaeus—Water Clover (Figure 30). $n = 20$; $2n = 40$. Lakes, ponds, and quiet streams. From Europe.

OPHIOGLOSSACEAE

Botrychium dissectum Sprengel—Cut-leaved Grape Fern (Figure 31). $n = 45$. Woods, open thickets, clearings, sandy barrens. [*B. dissectum* Sprengel var. *obliquum* (Muhlenberg ex Willdenow) Clute]

Botrychium lanceolatum (S. G. Gmelin) Ångström subsp. *angustisegmentum* (Pease & A. H. Moore) R. T. Clausen —Triangle Grape Fern (Figure 31). $n = 45$; $2n = 90$. Moist, cool, rich woods, swamp margins, meadows, peaty slopes, clearings. [*B. lanceolatum* var. *angustisegmentum* Pease & A. H. Moore]

Botrychium lunaria (Linnaeus) Swartz—Common Moonwort (Figure 31). $n = 45$; $2n = 90$. Open, gravelly or rocky slopes, pastures, meadows, shores, chiefly in calcareous soils.

Botrychium matricariifolium (Döll) A. Braun ex W. D. J. Koch—Daisyleaf Grape Fern (Figure 31). $n = 90$. Rich, usually moist, deciduous woods and thickets.

Botrychium minganense Victorin—Mingan Moonwort (Figure 32). $n = 90$; $2n = 180$. Habitats similar to those of *B. lunaria*. [*B. lunaria* (Linnaeus) Swartz forma *minganense* (Victorin) Clute; *B. lunaria* var. *minganense* (Victorin) Dole]

Botrychium multifidum (S. G. Gmelin) Ruprecht—Leathery Grape Fern (Figure 32). $n = 45$; $2n = 90, 180$. Peaty, sandy, or gravelly slopes, sparse woods, thickets, clearings, usually in acid soils. [*B. multifidum* var. *intermedium* (D. C. Eaton) Farwell]

Botrychium oneidense (Gilbert) House—Oneida Grape Fern. $n = 45$; $2n = 90$. Moist, acidic woods and swamps. [*B. dissectum* Sprengel var. *oneidense* (Gilbert) Farwell; *B. multifidum* (S. G. Gmelin) Ruprecht var. *oneidense* (Gilbert) Farwell]. Distribution data were not collected for this taxon as it was inadequately distinguished from *B. dissectum* Sprengel and *B. multifidum* (S. G. Gmelin) Ruprecht in New England herbaria.

Botrychium pallidum W. H. Wagner. $2n = 90$. A species reported in *Flora of North America* (Flora of North America Editorial

Committee 1993) as occurring in Maine; no voucher seen, no specific voucher for New England cited.

Botrychium rugulosum W. H. Wagner (Figure 32). $n = 45$. Open fields and secondary forests. We found no annotated vouchers for this relatively recently recognized taxon in New England herbaria. The distribution data are taken from W. H. Wagner, Jr., and F. S. Wagner (1982).

Botrychium simplex E. Hitchcock—Least Grape Fern (Figure 32). $n = 45$. Meadows, moist woods, edges of swamps and pastures, open shores, usually in poor soils. [*B. simplex* var. *tenebrosum* (A. A. Eaton) R. T. Clausen]

Botrychium virginianum (Linnaeus) Swartz—Rattlesnake Fern (Figure 33). $n = 92$; $2n = 184$. Rich woods and thickets in neutral to slightly acid soils. [*B. virginianum* var. *europaeum* Ångström]

Ophioglossum pusillum Rafinesque—Northern Adder's Tongue (Figure 33). $n = 480$; $2n = 960$. Peaty or grassy swales, meadows, damp thickets, damp sands. [*O. vulgatum* Linnaeus var. *pseudopodium* (S. F. Blake) Farwell]

OSMUNDACEAE

Osmunda cinnamomea Linnaeus—Cinnamon Fern (Figure 33). $n = 22$. Swamps, damp thickets, stream banks, and other moist, shaded places in acid soils. [*O. cinnamomea* var. *glandulosa* Waters]

Osmunda claytoniana Linnaeus—Interrupted Fern (Figure 33). $n = 22$; $2n = 44$. Moist woods, margins of swamps, moist thickets, occasionally in the open, in acid or neutral soils.

Osmunda regalis Linnaeus var. *spectabilis* (Willdenow) A. Gray—Royal Fern (Figure 34). $n = 22$; $2n = 44$. Swamps, peaty thickets, shores, meadows, bogs, mostly in acid soils.

—*Osmunda* Hybrids—

Osmunda cinnamomea Linnaeus $\times$ *Osmunda claytoniana* Linnaeus (Figure 34).

Osmunda $\times$ *ruggii* R. M. Tryon (Figure 34). [= *O. claytoniana* Linnaeus $\times$ *O. regalis* Linnaeus var. *spectabilis* (Willdenow) A. Gray]

POLYPODIACEAE

Polypodium appalachianum Haufler & Windham—Appalachian Polypody (Figure 34). $n = 37$; $2n = 74$. Cliffs and rocky slopes. [Data are from the herbaria of the New England Botanical Club and Harvard University.]

Polypodium virginianum Linnaeus—Common Polypody (Figure 35). $n = 74$; $2n = 148$. On rocks, cliffs, tree bases, rocky (occasionally sandy) slopes, usually in acid soils. [*P. vulgare* Linnaeus var. *virginianum* (Linnaeus) D. C. Eaton]

PTERIDACEAE

Adiantum aleuticum (Ruprecht) Paris—Aleutian Maidenhair Fern (Figure 35). $n = 29$. Serpentine barrens. [*A. pedatum* Linnaeus var. *aleuticum* Ruprecht; *A. pedatum* subsp. *calderi* Cody]

ADIANTUM HISPIDULUM Swartz. $n = 171$. A species from Asia reported in *Flora of North America* (Flora of North America Editorial Committee 1993) as escaped in Connecticut; no voucher seen, no specific voucher for New England cited.

Adiantum pedatum Linnaeus—Common Maidenhair Fern (Figure 35). $n = 29$, 58II, 57II + 2I, 56II + R4, 56II + chIV, 54I + 2II; $2n = 58$, 60. Rich, deciduous woods, in circumneutral or basic soil.

—*Adiantum* Hybrids—

Adiantum × *viridimontanum* Paris (Figure 35). $n = 58$. [= *A. aleuticum* (Ruprecht) Paris × *A. pedatum* Linnaeus]

Cheilanthes lanosa (Michaux) D. C. Eaton—Hairy Lip Fern (Figure 36). $n = 30$. Rocks and cliffs, calcareous or siliceous. [*C. vestita* (Sprengel) Swartz]

Cryptogramma stelleri (S. G. Gmelin) Prantl—Slender Cliff-brake (Figure 36). $n = 30$. Shaded, moist, calcareous cliffs and rock ledges, typically in coniferous woods.

Pellaea atropurpurea (Linnaeus) Link—Purple Cliff-brake (Figure 36). $n = 87$. Dry, exposed, calcareous rocks (occasionally on crumbling mortar), trap rock.

Pellaea glabella Mettenius ex Kuhn—Smooth Cliff-brake (Figure 36). $n = 116$. Dry, calcareous rocks and cliffs.

SALVINIACEAE

SALVINIA NATANS (Linnaeus) Allioni—Floating Fern (Figure 37). $n = 18$; $2n = 18, 36$. On still waters of ponds or slow streams. From Europe and Asia. [Records from New England are likely to be misidentified as *S. rotundifolia* Willdenow (Nauman 1993)]. This species is mentioned, but not treated in *Flora of North America* (Flora of North America Editorial Committee 1993).

THELYPTERIDACEAE

Phegopteris connectilis (Michaux) Watt—Long Beech Fern (Figure 37). $n = 60, 90$; $2n = 90$. Rich, damp woods, cool, shaded, rocky banks, moist cliffs. [*Dryopteris phegopteris* (Linnaeus) C. Christensen; *Thelypteris phegopteris* (Linnaeus) Slosson]

Phegopteris hexagonoptera (Michaux) Fée—Broad Beech Fern (Figure 37). $2n = 60$. Rich woods and thickets. [*Dryopteris hexagonoptera* (Michaux) C. Christensen; *Thelypteris hexagonoptera* (Michaux) Nieuwland]

Thelypteris noveboracensis (Linnaeus) Nieuwland—New York Fern (Figure 37). $n = 27$. Moist woods and thickets. [*Dryopteris noveboracensis* (Linnaeus) A. Gray]

Thelypteris palustris Schott var. *pubescens* (Lawson) Fernald—Marsh Fern (Figure 38). $n = 35$. Swamps, low damp thickets, meadows, marshes, bogs, along ditches and streams. [*Dryopteris thelypteris* (Linnaeus) A. Gray var. *pubescens* (Lawson) Weatherby]

Thelypteris simulata (Davenport) Nieuwland—Massachusetts Fern (Figure 38). $n = 64$. Swampy or boggy woods and thickets, on knolls in bogs, in acid soils. [*Dryopteris simulata* Davenport]

CONIFEROPHYTA

CUPRESSACEAE

Chamaecyparis thyoides (Linnaeus) Britton, Sterns & Poggenburg—Atlantic White Cedar (Figure 38). Swamps, wet thickets.

Juniperus communis Linnaeus var. *depressa* Pursh—Ground Juniper (Figure 38). $2n = 22$. Poor soils in open areas, especially old pastures and ledges, persisting in recent woodlands. [Larger individuals have been misidentified as var. *communis*.]

Juniperus horizontalis Moench—Creeping Juniper (Figure 39). $2n = 22$. Ledges, sandy or rocky banks.

Juniperus virginiana Linnaeus—Eastern Red Cedar (Figure 39). Mostly dry, open sites (typically old fields), rocky slopes, bor-

ders of salt marshes, persisting in recent woodlands. [*J. virginiana* var. *crebra* Fernald & Griscom]

—*Juniperus* Hybrids—

Juniperus communis Linnaeus var. *depressa* Pursh $\times$ *Juniperus virginiana* Linnaeus (Figure 39).

Juniperus horizontalis Moench $\times$ *Juniperus virginiana* Linnaeus (Figure 39).

Thuja occidentalis Linnaeus—Arbor-vitae (Figure 40). $2n = 22$. Swamps, rocky banks of ponds and rivers, old pastures, in calcareous soils.

PINACEAE

Abies balsamea (Linnaeus) Miller—Balsam Fir (Figure 40). $2n = 24$. Damp, rich, cool woods, swamps, mountain slopes. [*A. balsamea* var. *phanerolepis* Fernald]

LARIX DECIDUA Miller—European Larch (Figure 40). $2n = 24$. Near habitations in moist woods and clearings. From Europe.

Larix laricina (Du Roi) K. Koch—Tamarack (Figure 40). $n = 12$; $2n = 24$. Northward in poorly drained lowlands, swamps, bogs, shaded hillsides, sometimes to tree line on mountain slopes; southward in cold swamps and bogs.

PICEA ABIES (Linnaeus) H. Karsten—Norway Spruce (Figure 41). $n = 12$; $2n = 24$. Woods and hedgerows. From Europe.

Picea glauca (Moench) Voss—White Spruce (Figure 41). $n = 12$; $2n = 24$. Moist woods, dry sandy soils, old pastures, rocky slopes, exposed hilltops, ocean cliffs.

Picea mariana (Miller) Britton, Sterns & Poggenburg—Black Spruce (Figure 41). $n = 12$; $2n = 24$. Northward on mountain slopes, rocky hillsides, high banks of streams, bogs; southward in sphagnum bogs and swamps.

Picea rubens Sargent—Red Spruce (Figure 41). $n = 12$; $2n = 24$. Rocky, well-drained, upland woods, mountain slopes, occasionally in swamps (southward).

Pinus banksiana Lambert—Jack Pine (Figure 42). $2n = 18, 24$. Sterile sand or rocky soils, rocky slopes and ledges, escaped from plantations at roadsides and bog margins (southward).

PINUS MUGO Turra—Swiss Mountain Pine (Figure 42). $2n = 24$. Old pastures. From Europe. *PINUS MUGO* is not treated in *Flora of North America* (Flora of North America Editorial Committee 1993).

PINUS NIGRA Arnott—Austrian Pine (Figure 42). $2n = 18, 24$. From Europe. *PINUS NIGRA* is mentioned, but not treated in *Flora of North America* (Flora of North America Editorial Committee 1993).

Pinus resinosa Aiton—Red Pine (Figure 42). $2n = 24$. Sandy or gravelly soil in dry woods and barrens, mountain slopes, ledges, occasionally in peat bogs.

Pinus rigida Miller—Pitch Pine (Figure 43). $2n = 24$. Dry, sterile, sandy or gravelly soils, rocky slopes, occasionally in cold swamps and bogs.

Pinus strobus Linnaeus—Eastern White Pine (Figure 43). $n = 12$; $2n = 24$. Sandy or fertile, well-drained soils, but tolerating wet ground (rarely in bogs).

PINUS SYLVESTRIS Linnaeus—Scotch Pine (Figure 43). $n = 12$; $2n = 24$. Roadsides, fallow fields, dry woods. From Eurasia. Our plants are apparently all var. *SYLVESTRIS*.

PINUS THUNBERGII Parlatores—Japanese Black Pine (Figure 43). $n = 12$; $2n = 24$. Dry sandy soils. From Asia. *PINUS THUNBERGII* is mentioned, but not treated in *Flora of North America* (Flora of North America Editorial Committee 1993).

Tsuga canadensis (Linnaeus) Carrière—Eastern Hemlock (Figure 44). $n = 12$; $2n = 24$. Cool moist slopes, ravines, moist woods, swamps, mucky soils near ponds and streams.

TAXACEAE

Taxus canadensis Marshall—American Yew (Figure 44). $2n = 24$. Damp, rich, or swampy woods, mostly in the shade of conifers, ravines and near streams, occasionally on moist, rocky slopes at higher elevations.

TAXUS CUSPIDATA Siebold & Zuccarini—Japanese Yew (Figure 44). From Asia. *TAXUS CUSPIDATA* is mentioned but not treated in *Flora of North America* (Flora of North America Editorial Committee 1993).

ACKNOWLEDGMENTS. We thank the curators and directors of the herbaria of Brown University, Harvard University, the University of Maine, University of Massachusetts, the University of New Hampshire, the University of Rhode Island, and the University of Vermont for allowing us access to their collections. We particularly appreciate the kindness of David Barrington, Chris Campbell and Karen Searcy for allowing use of the collections in their care outside of normal hours of operation. We are grateful also to Karen Searcy for allowing access to the notebooks of Harry E. Ahles at the University of Massachusetts. Leslie J. Mehrhoff was very generous in sharing data on pteridophytes and gymnosperms that he has collected from the herbaria at the University of Connecticut and Yale University. James Hinds assisted by checking the University of Maine herbarium for some discrepancies in the Harry Ahles data. Thomas Vining, at the University of Maine, checked additional specimen data for us at that institution. David Barrington, David S. Conant, and James Hickey made many helpful comments on various versions of the manuscript and Warren H. “Herb” Wagner was particularly helpful and encouraging. Lastly, we thank Bruce A. Sorrie for collecting data from the Harvard University herbaria in the early stages of this project.



Figure 1. Key map for counties of the New England states (and Mt. Desert Island, Maine and Block Island, Rhode Island and arbitrary divisions of larger Maine counties and Coös County, New Hampshire).

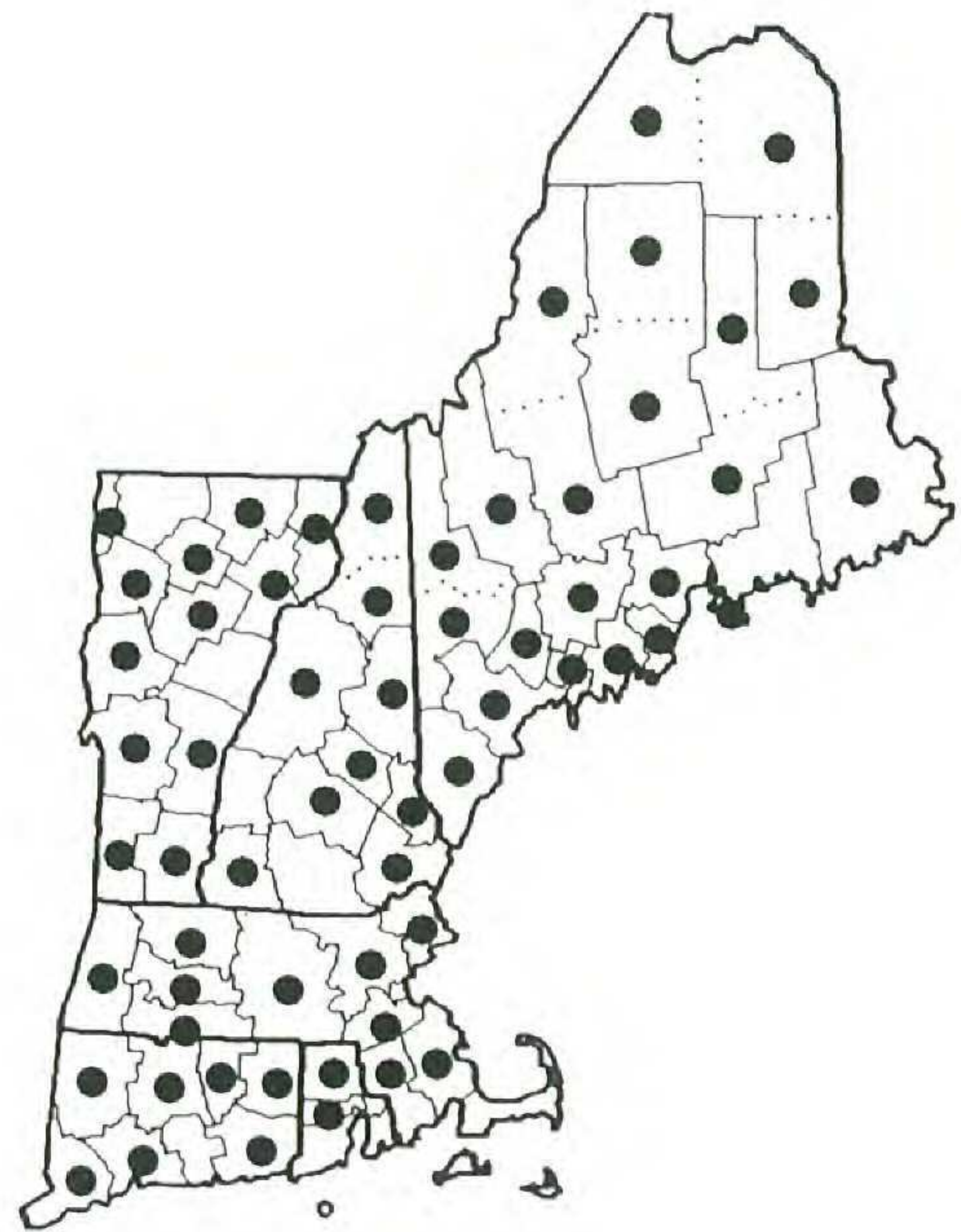
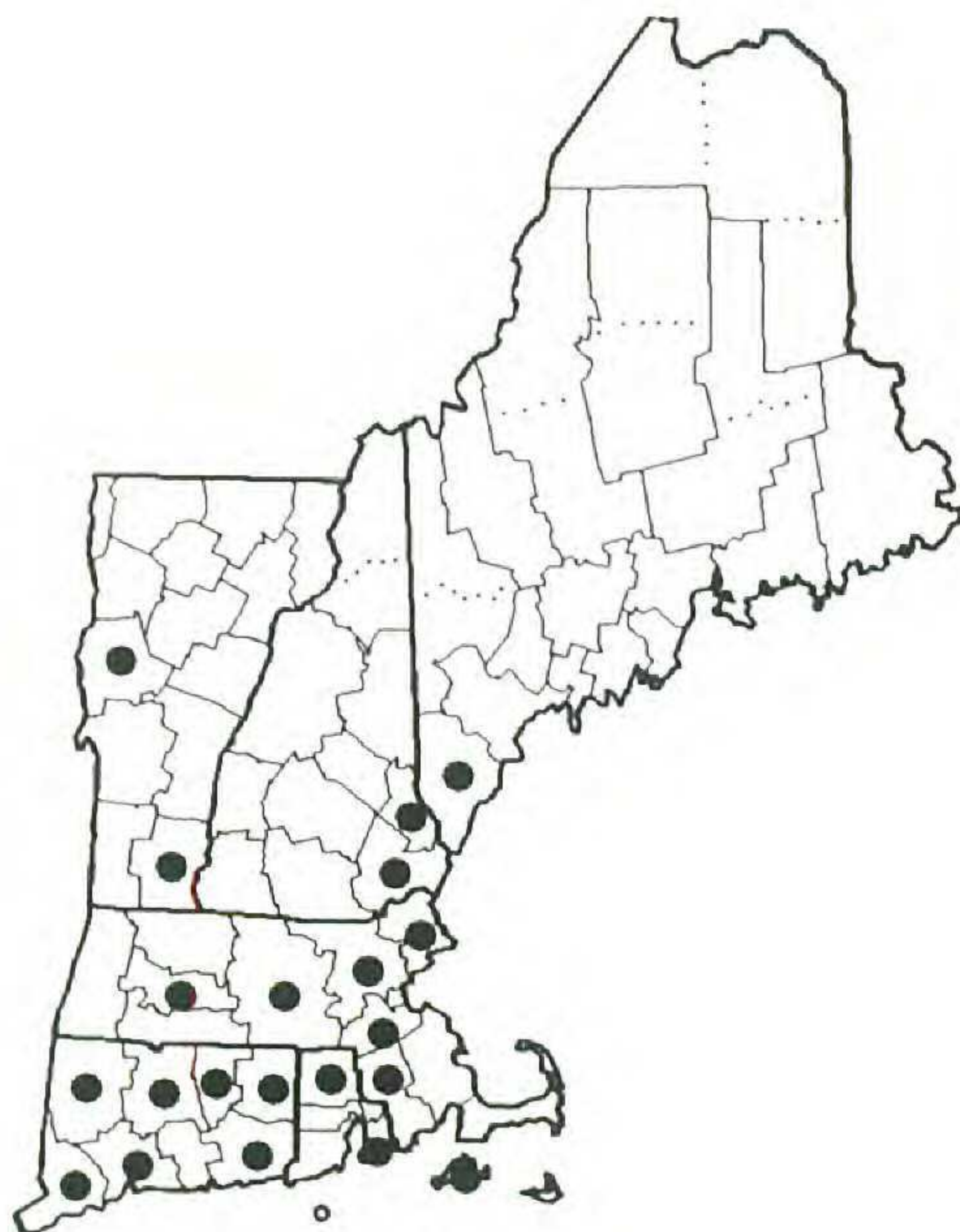
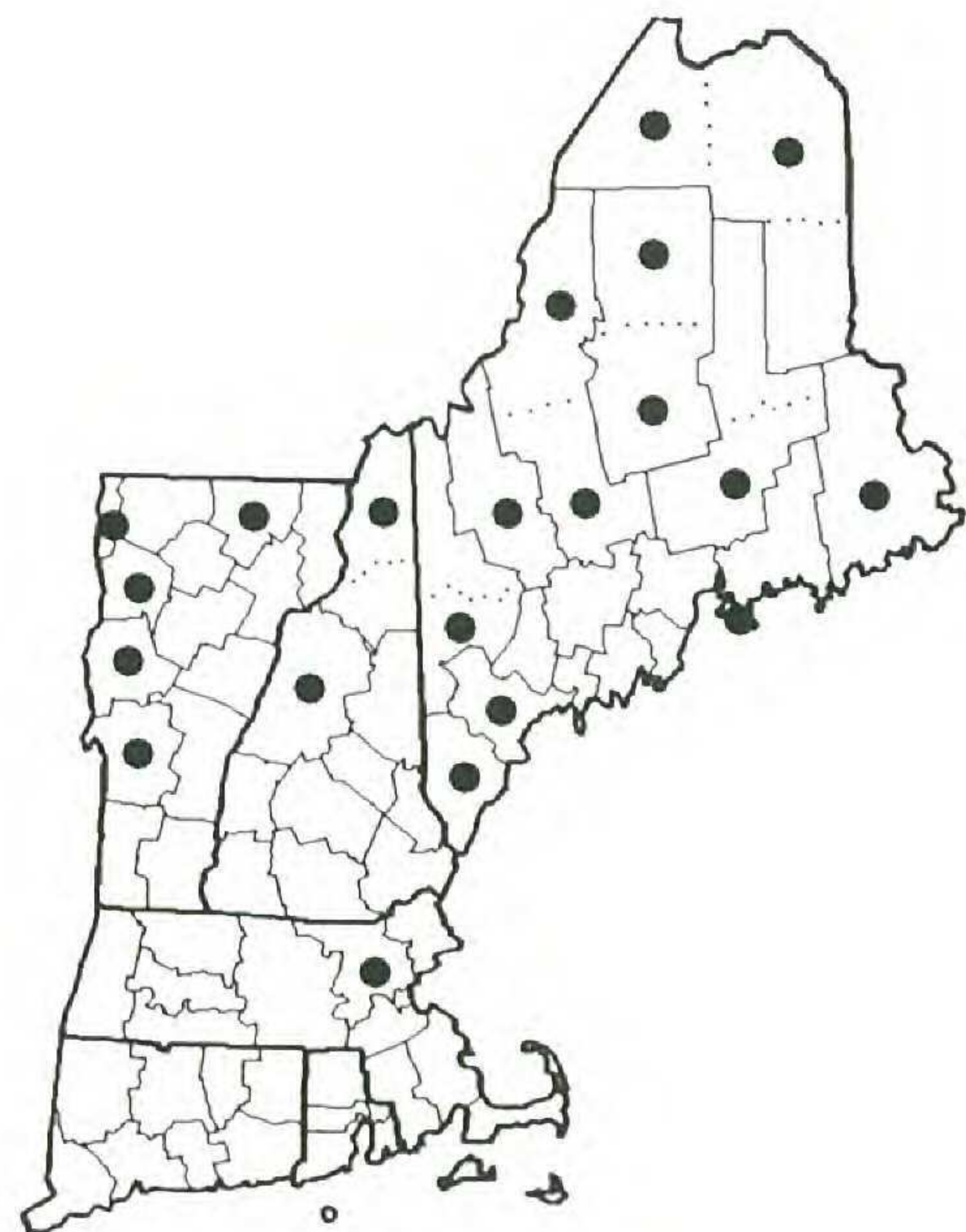
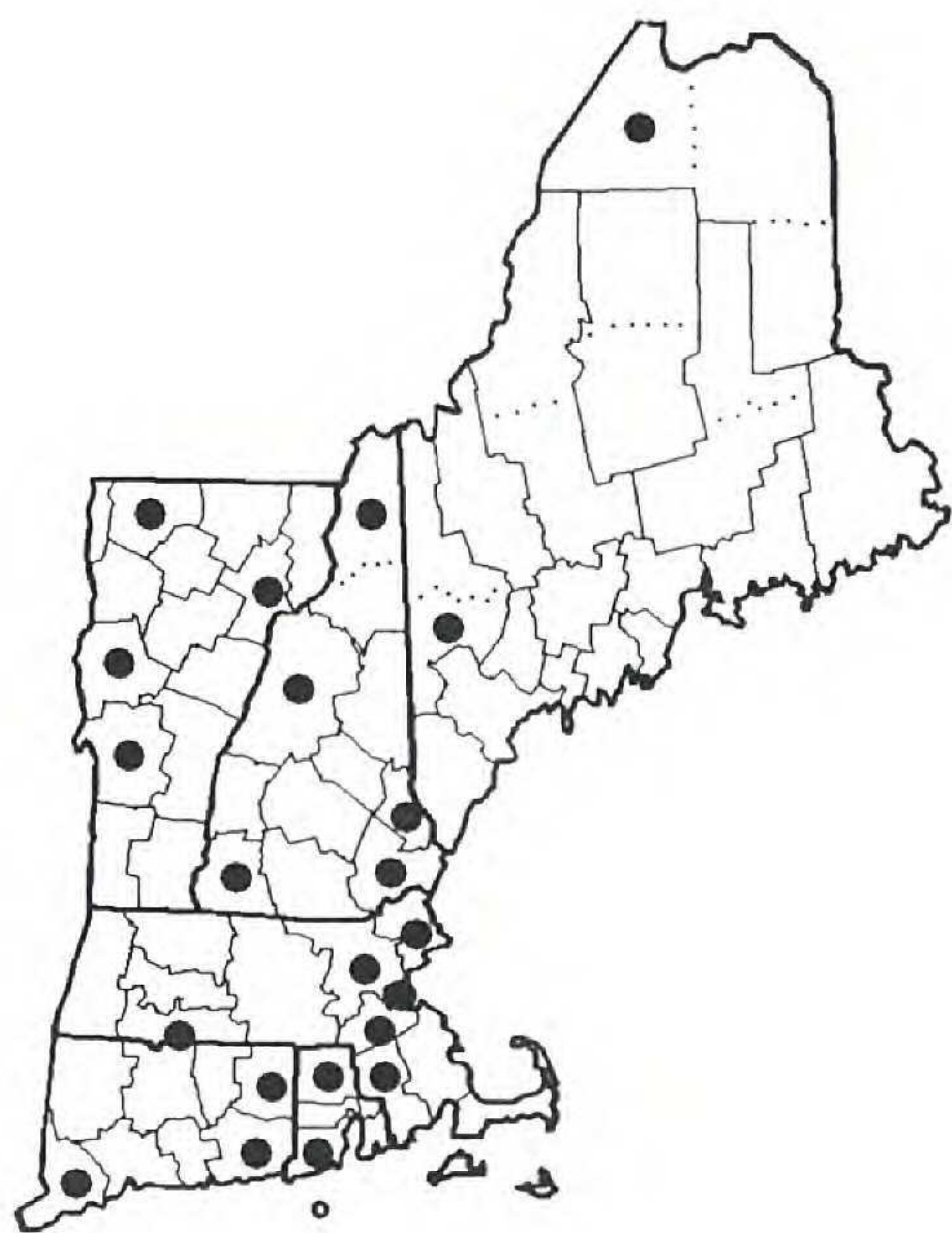
*Isoetes acadiensis**Isoetes echinospora**Isoetes engelmannii**Isoetes lacustris*

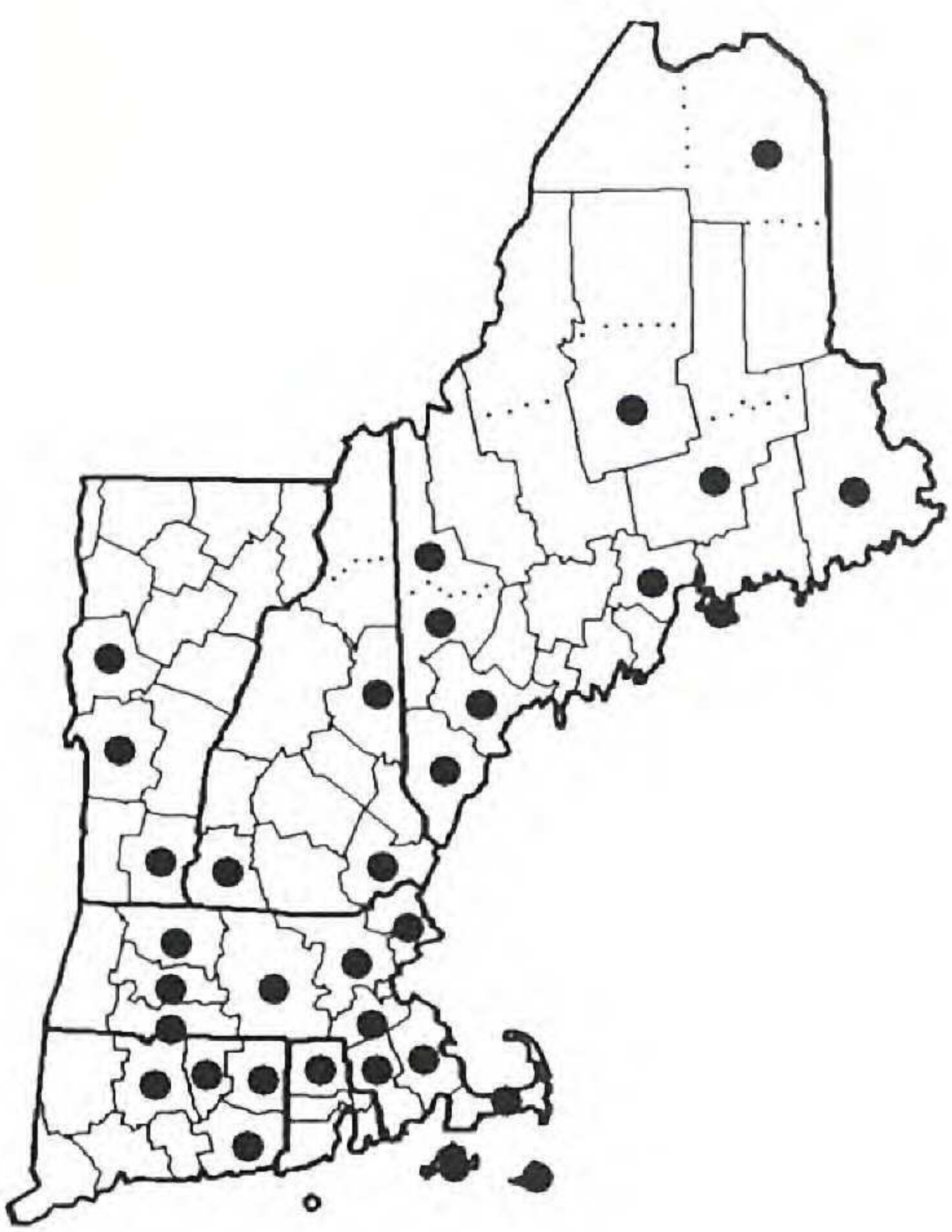
Figure 2. Distribution maps for *Isoetes acadiensis*, *I. echinospora*, *I. engelmannii*, and *I. lacustris*.



Isoetes prototypus



Isoetes riparia

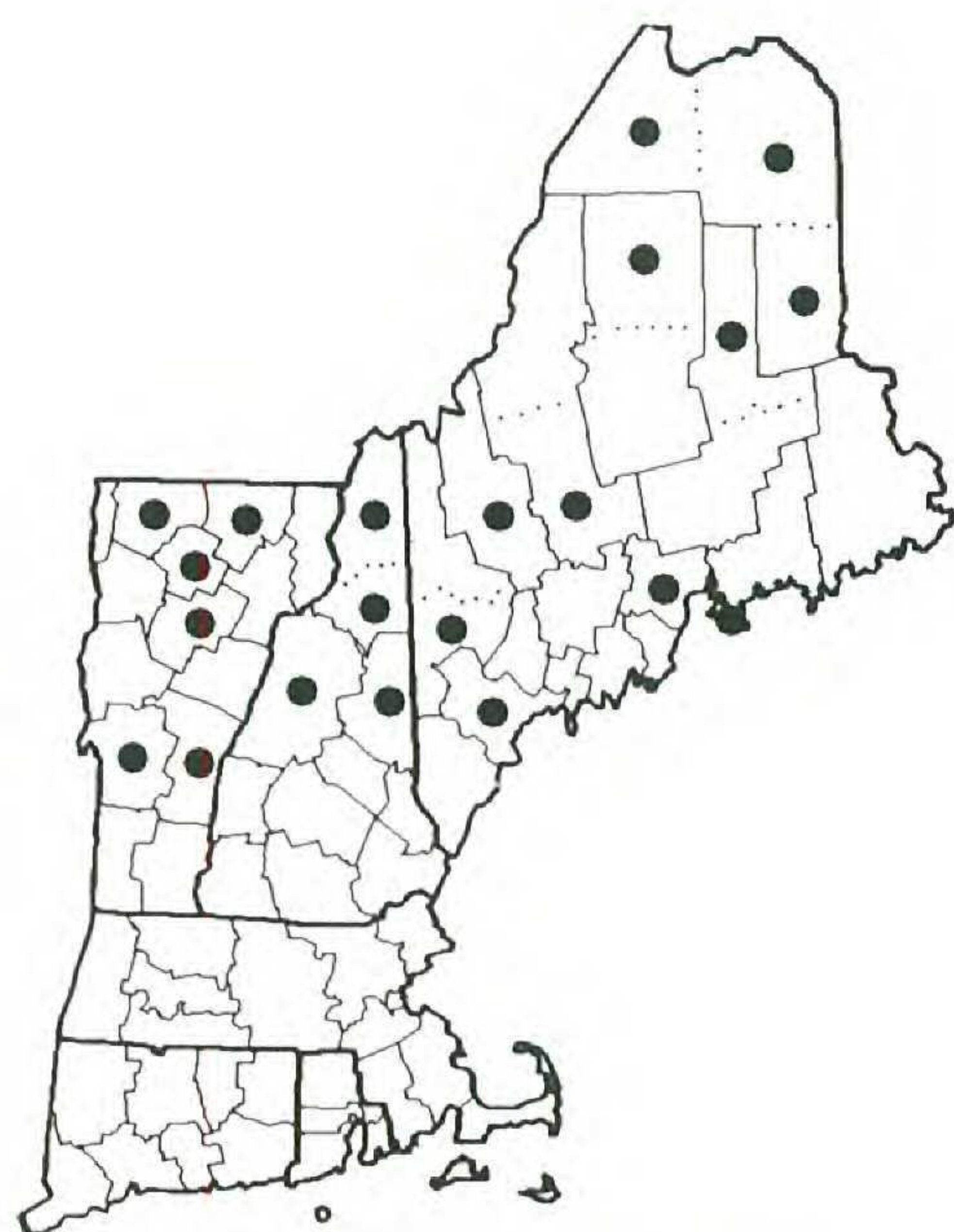


Isoetes tuckermanii

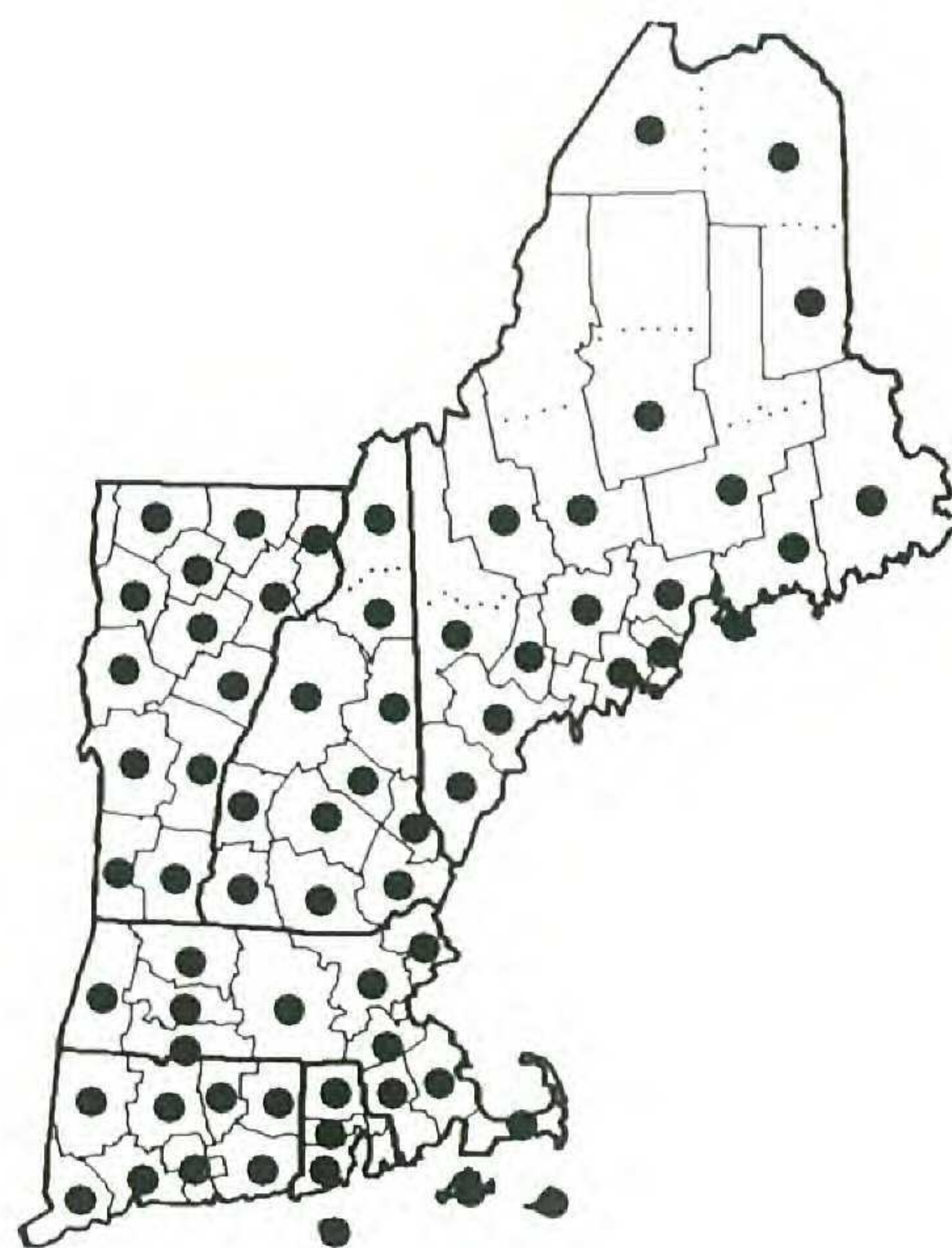


Isoetes x eatonii

Figure 3. Distribution maps for *Isoetes prototypus*, *I. riparia*, *I. tuckermanii*, and *I. x eatonii*.



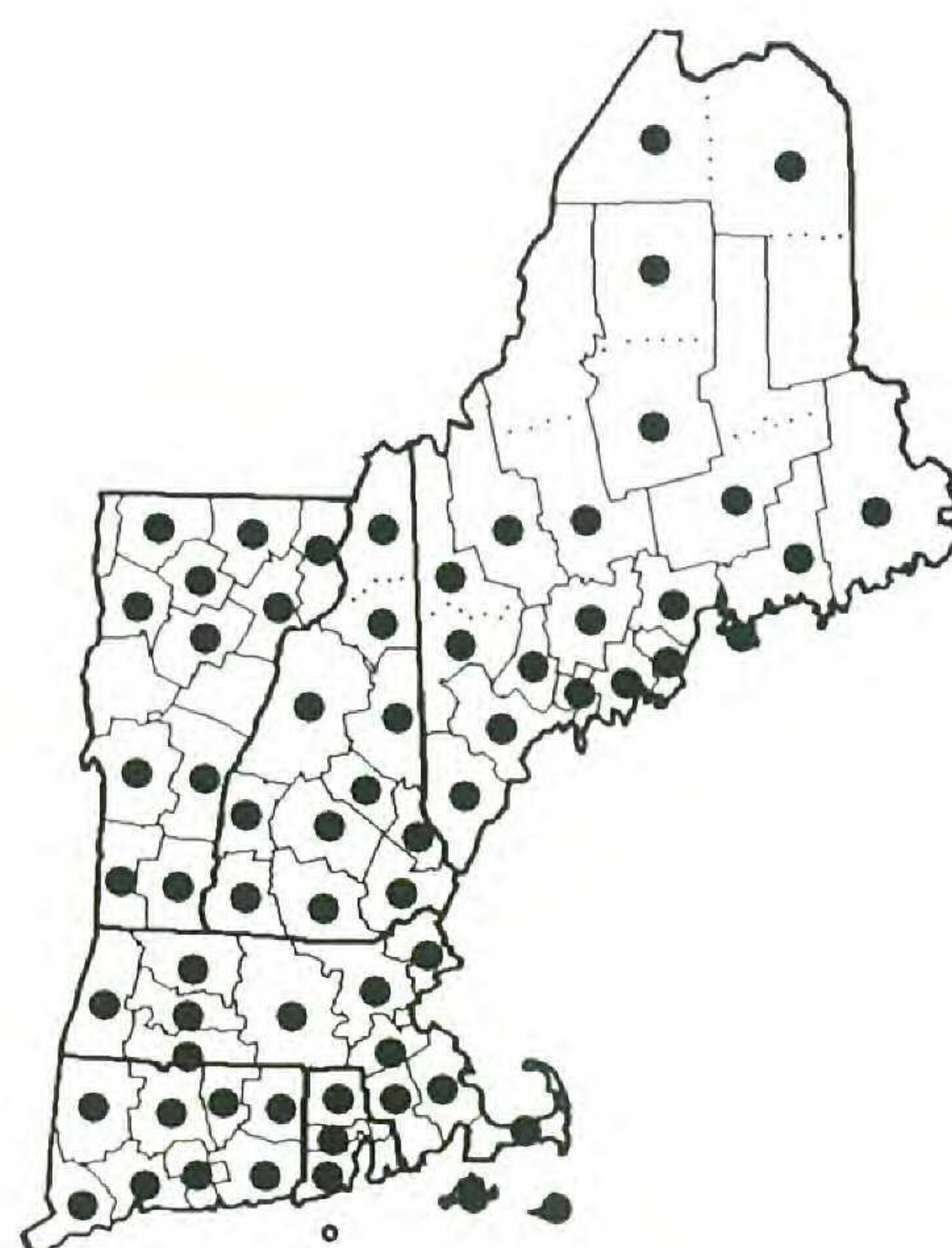
Diphasiastrum complanatum



Diphasiastrum digitatum



Diphasiastrum sitchense



Diphasiastrum tristachyum

Figure 4. Distribution maps for *Diphasiastrum complanatum*, *D. digitatum*, *D. sitchense*, and *D. tristachyum*.



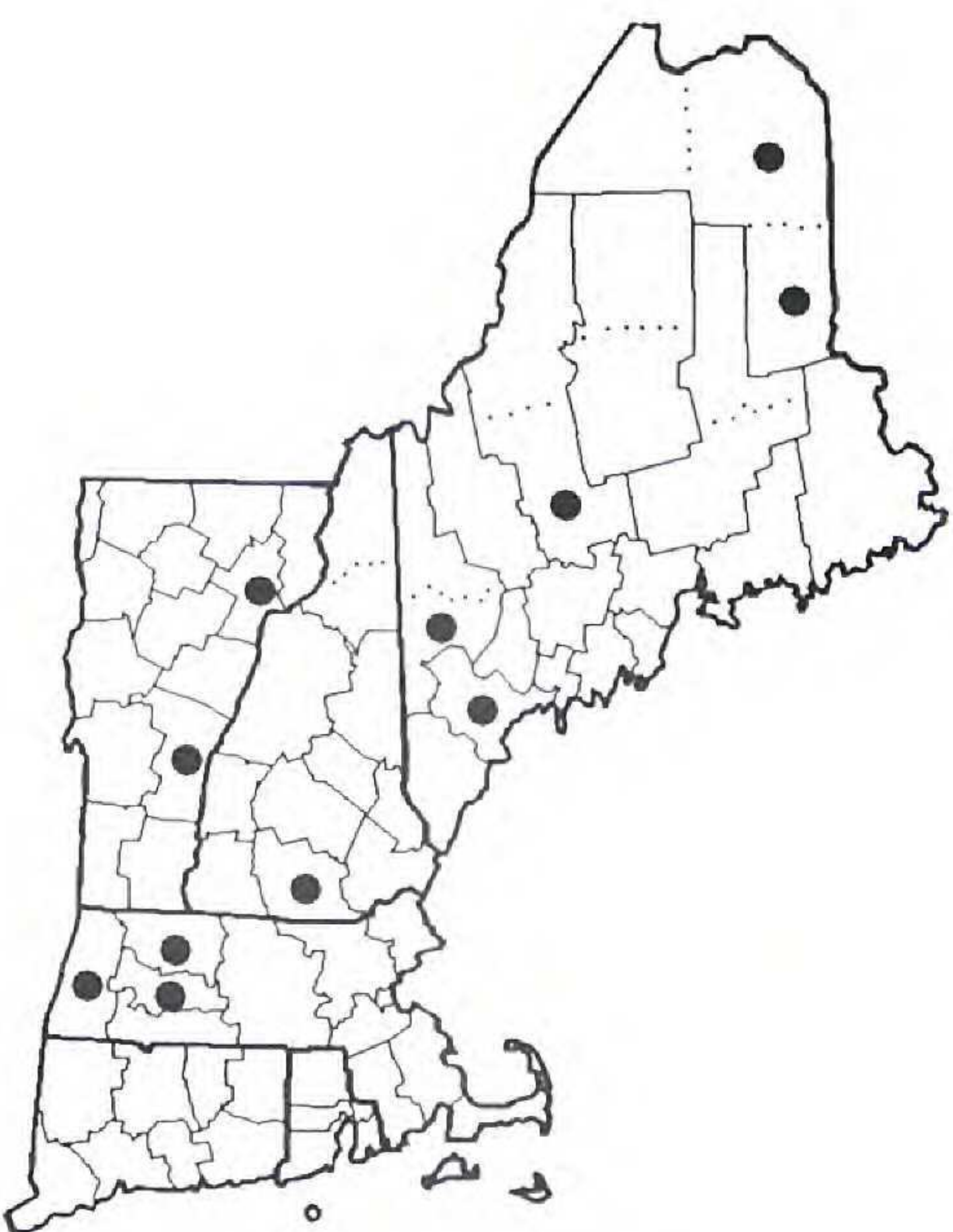
Diphasiastrum alpinum
x *D. complanatum*



Diphasiastrum complanatum
x *D. digitatum*



Diphasiastrum digitatum
x *D. x sabinifolium*



Diphasiastrum x habereri

Figure 5. Distribution maps for *Diphasiastrum alpinum* x *D. complanatum*, *D. complanatum* x *D. digitatum*, *D. digitatum* x *D. x sabinifolium*, and *D. x habereri*.

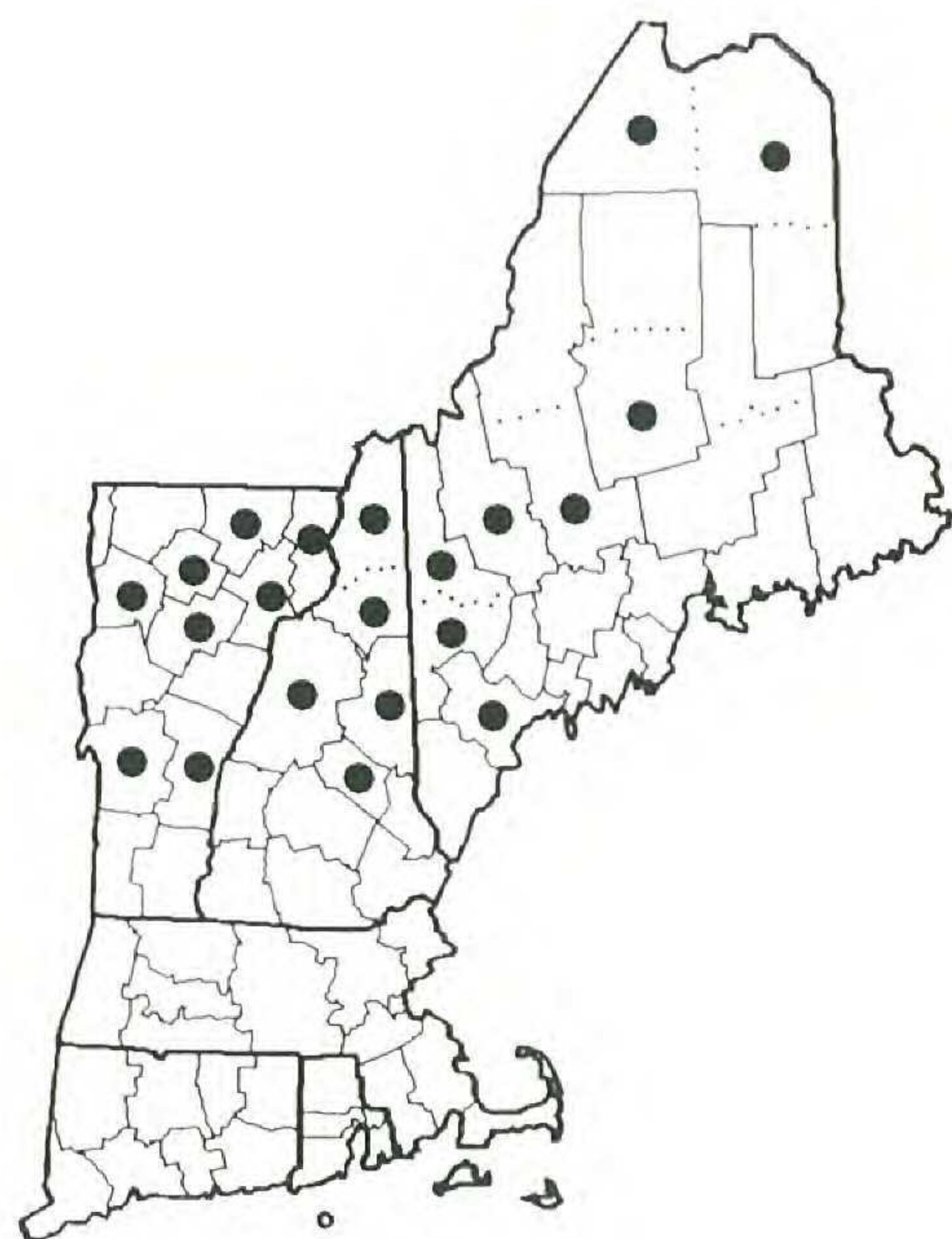
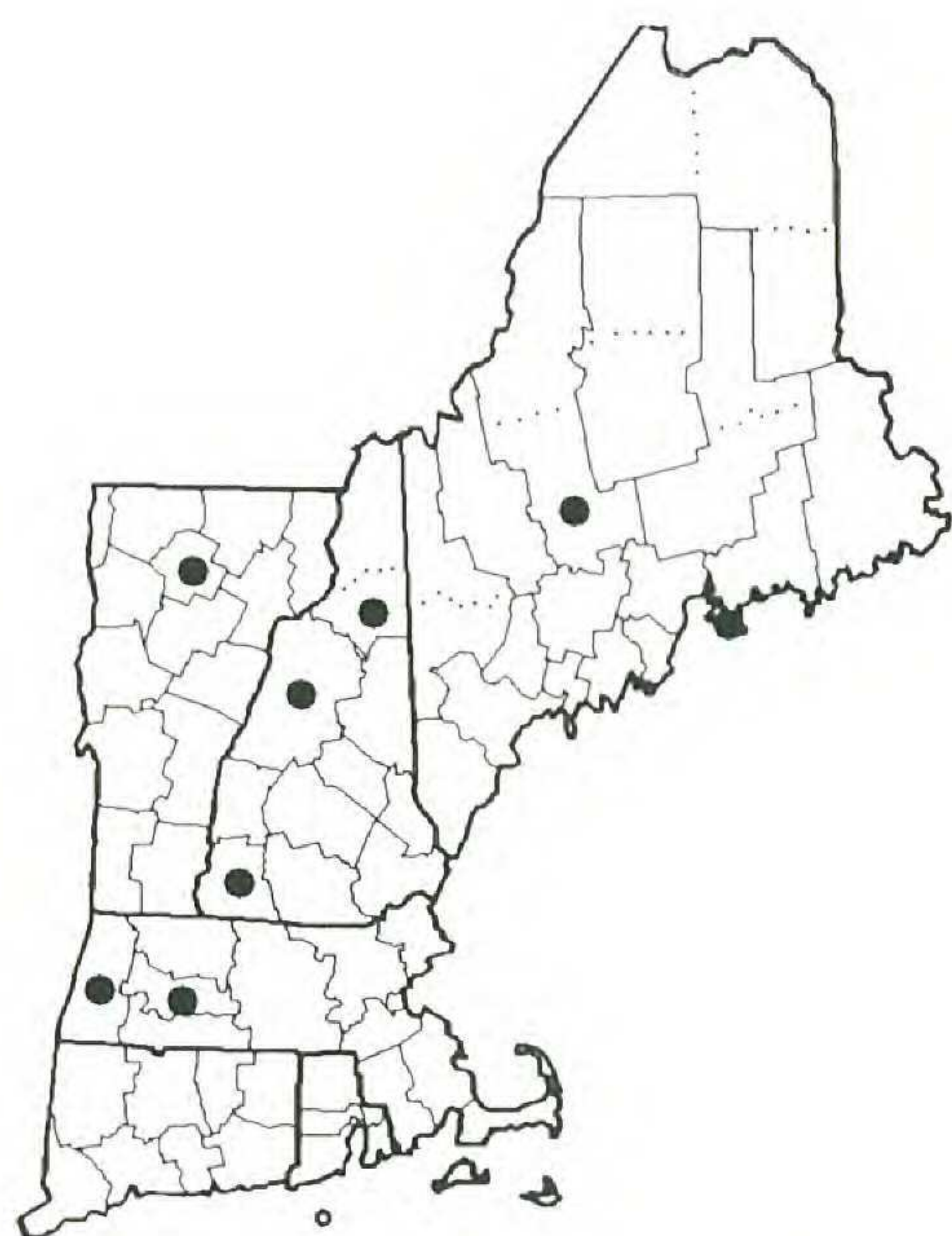
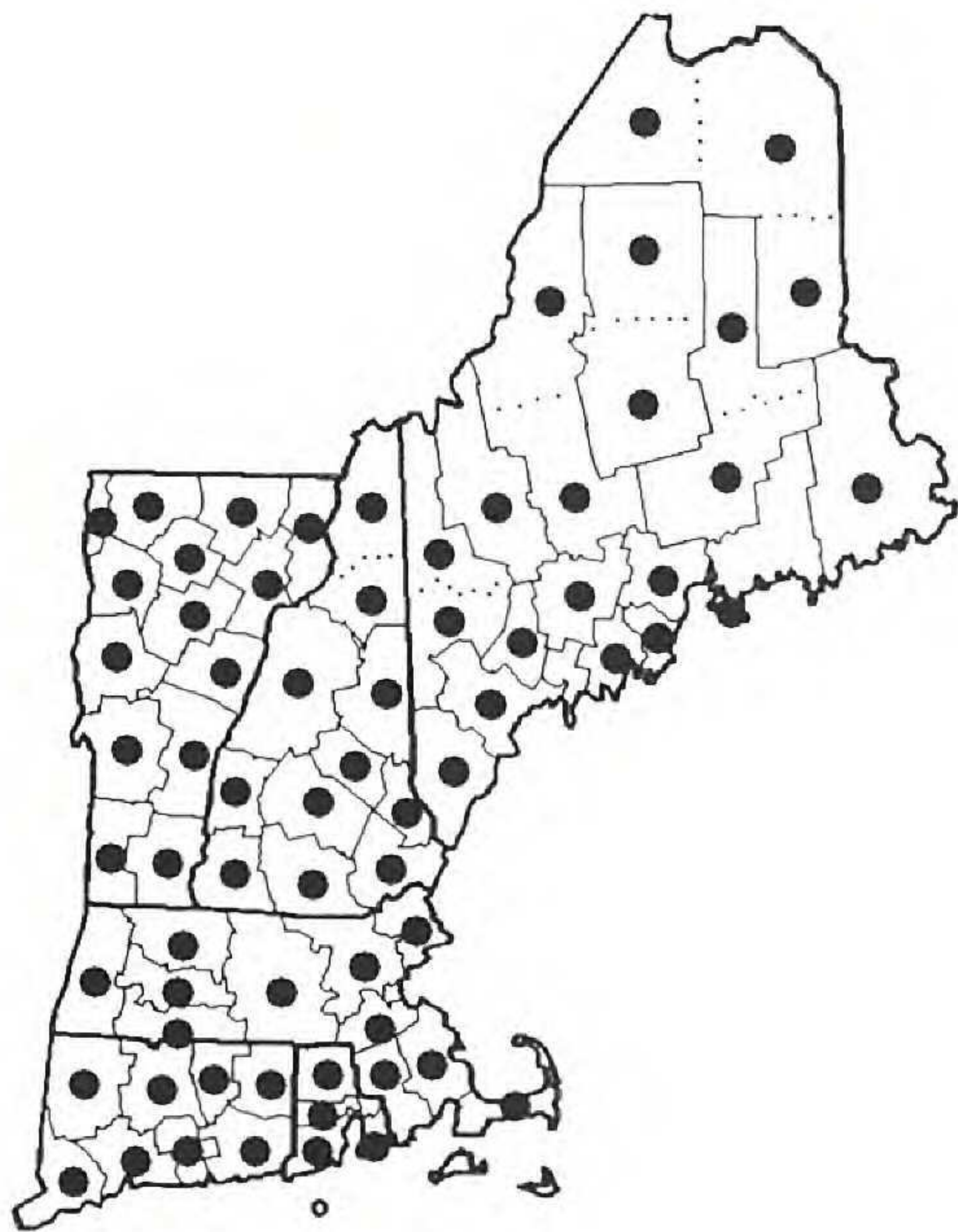
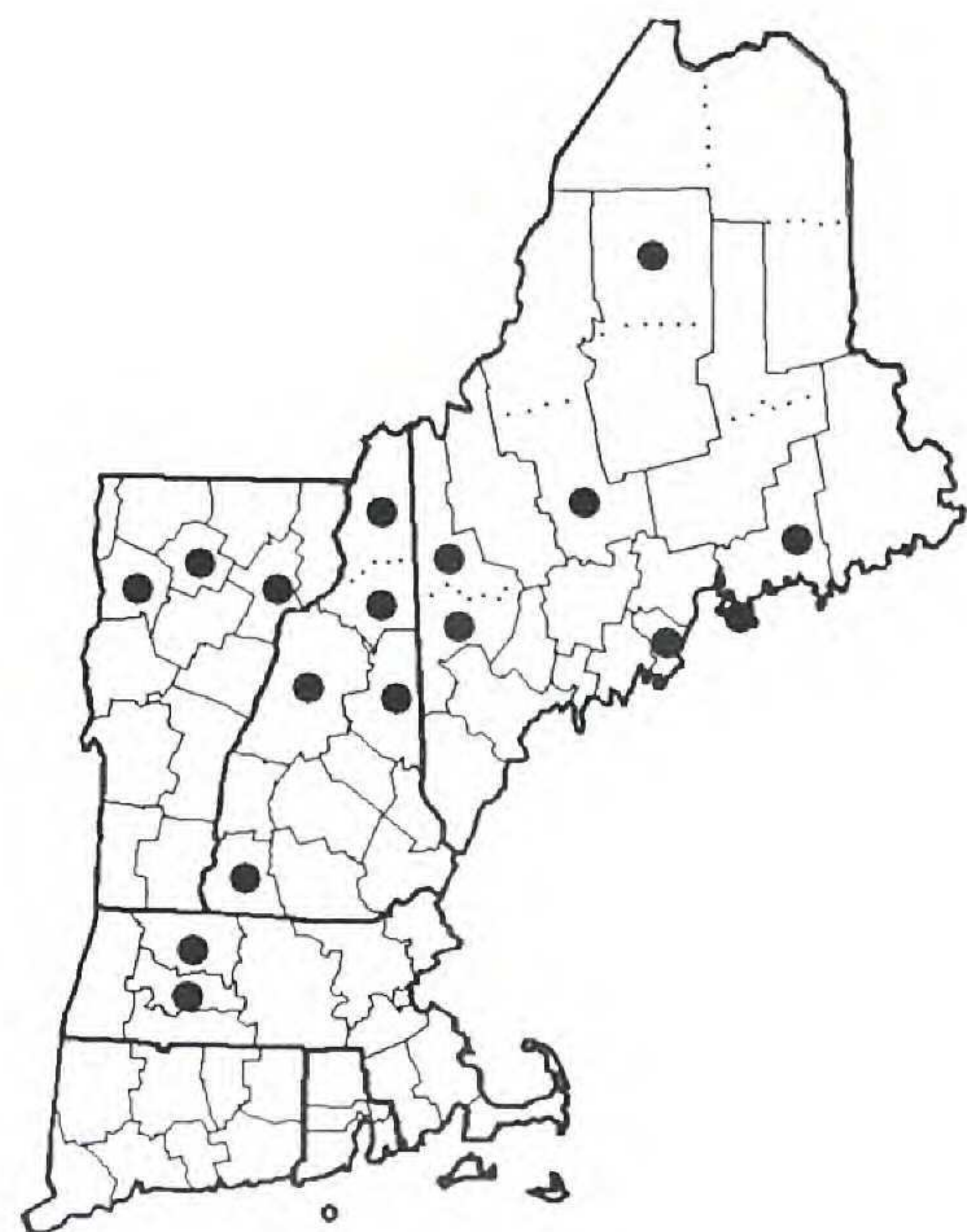
*Diphasiastrum x issleri**Diphasiastrum x sabinifolium**Diphasiastrum x zeilleri**Huperzia appalachiana*

Figure 6. Distribution maps for *Diphasiastrum x issleri*, *D. x sabinifolium*, *D. x zeilleri*, and *Huperzia appalachiana*.



Huperzia lucidula



Huperzia selago



Huperzia appalachiana
× *lucidula*



Huperzia appalachiana
× *selago*

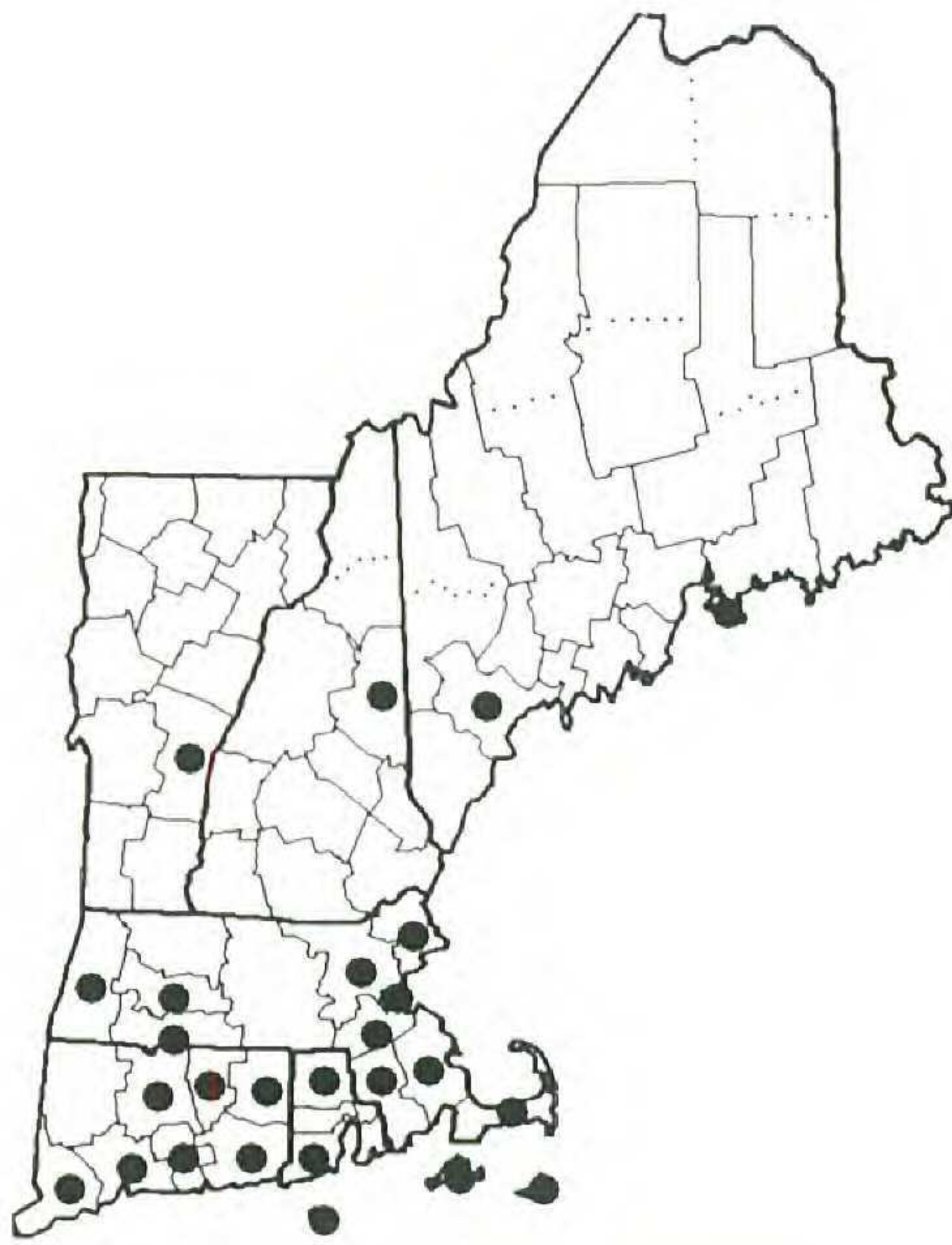
Figure 7. Distribution maps for *Huperzia lucidula*, *H. selago*, *H. appalachiana* × *H. lucidula*, and *H. appalachiana* × *H. selago*.



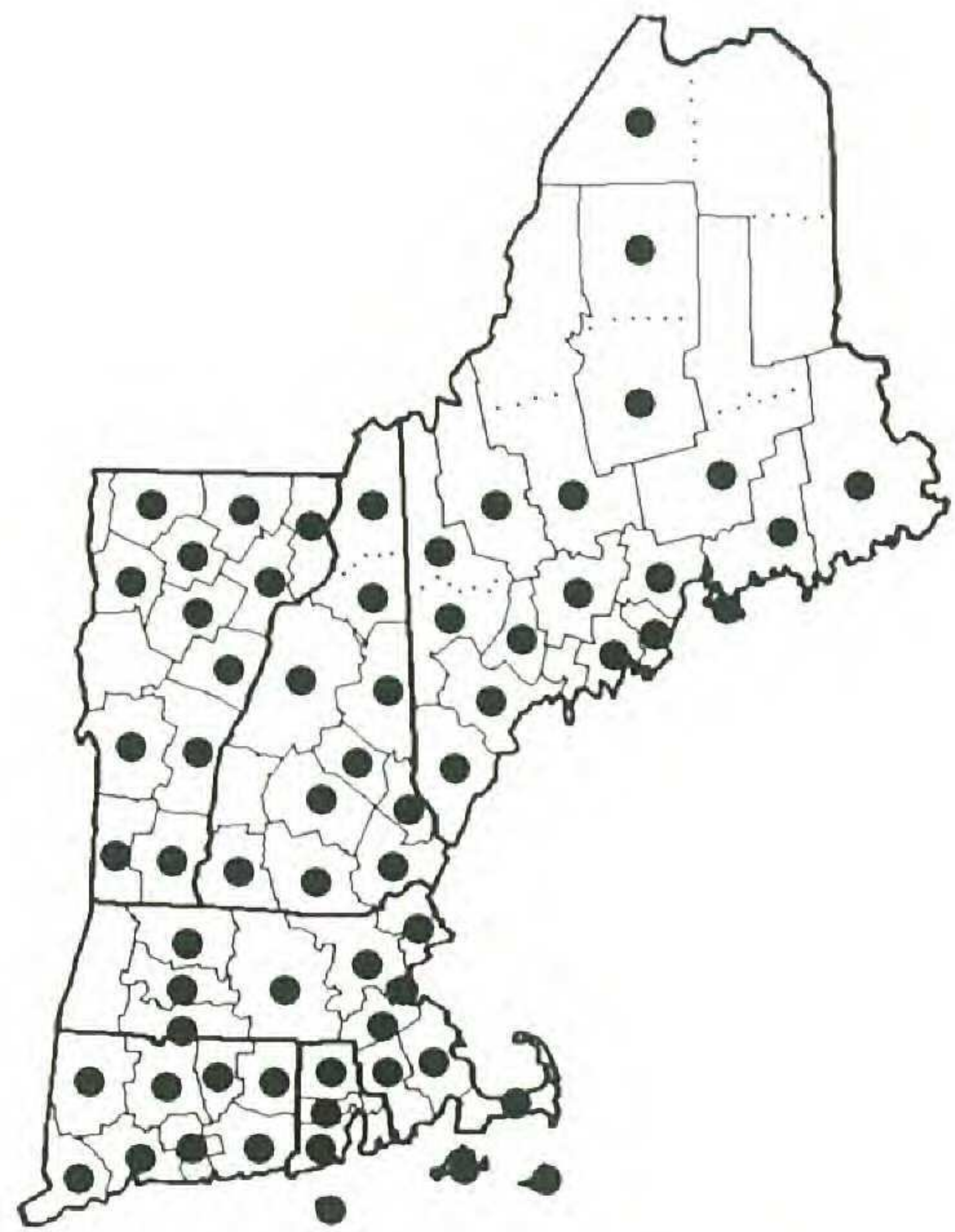
Huperzia × *buttersii*



Lycopodiella alopecuroides



Lycopodiella appressa

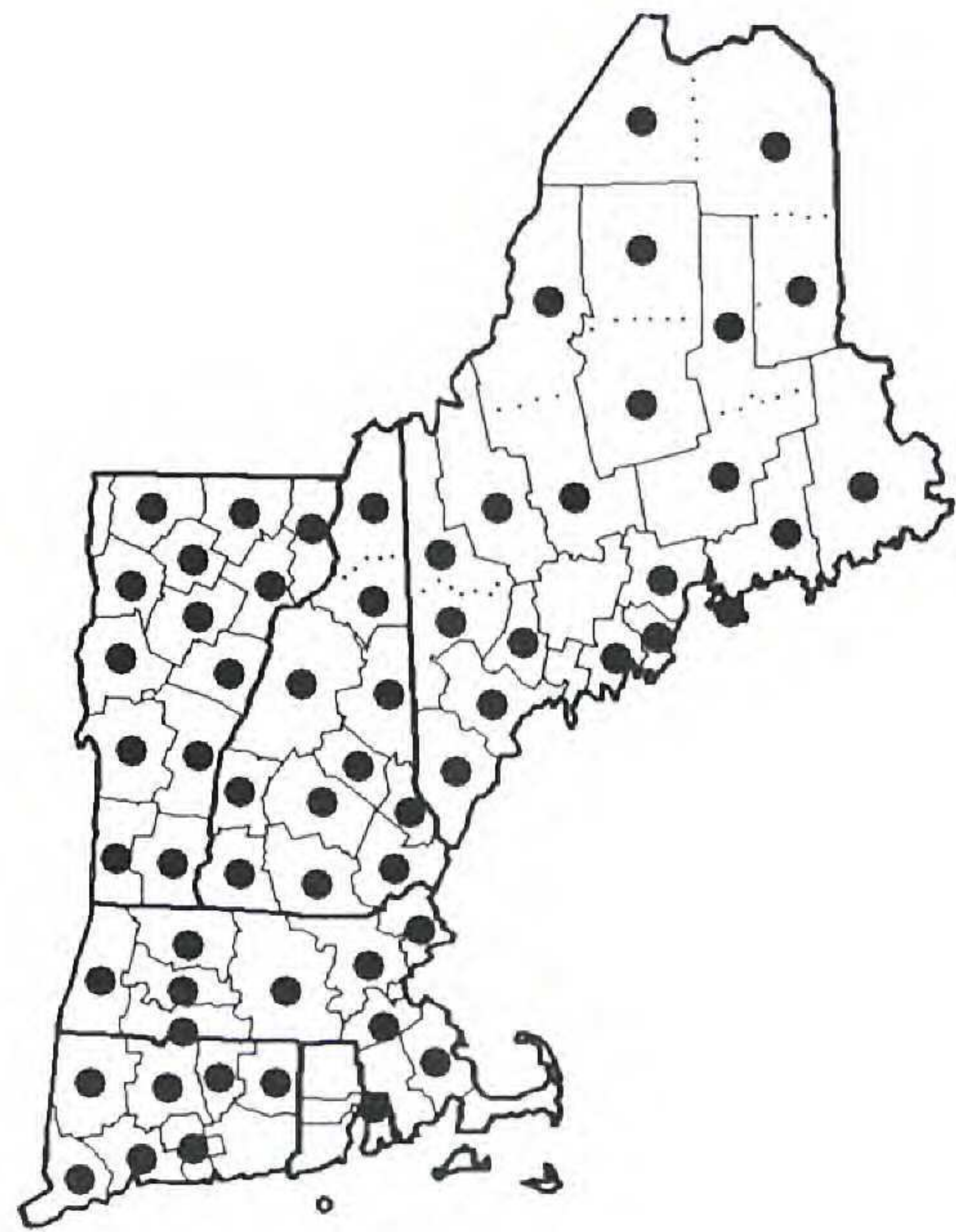


Lycopodiella inundata

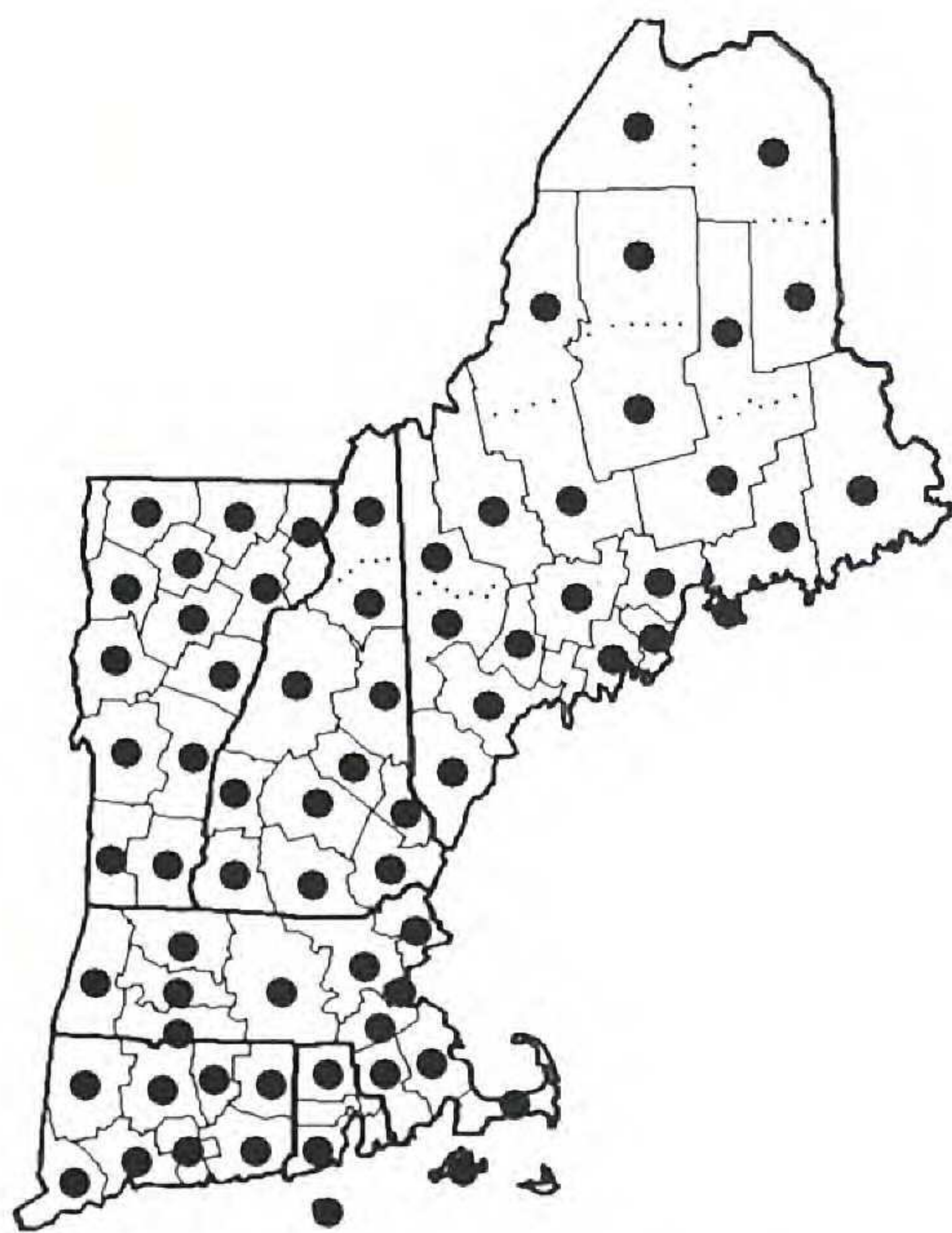
Figure 8. Distribution maps for *Huperzia* × *buttersii*, *Lycopodiella alopecuroides*, *L. appressa*, and *L. inundata*.



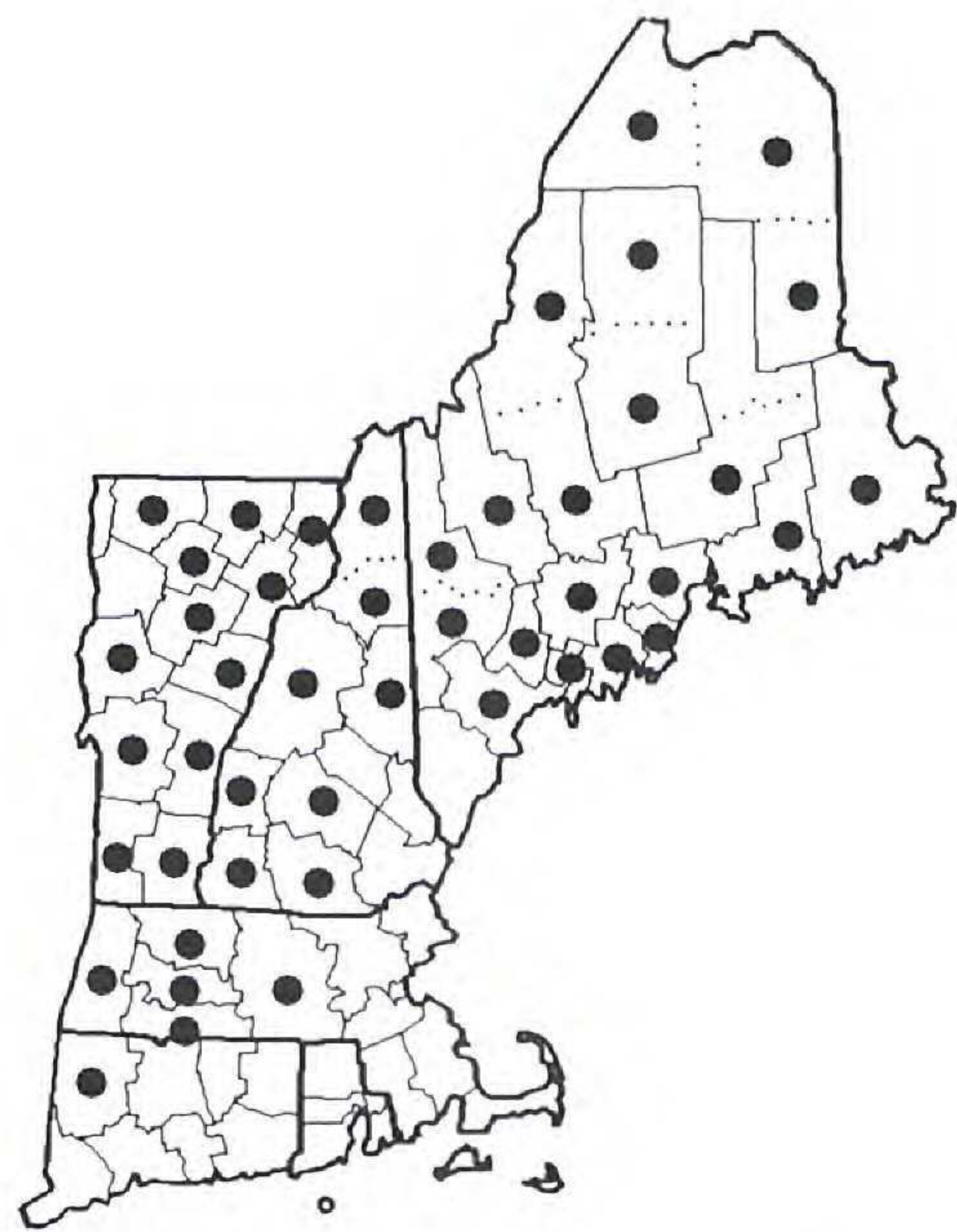
Lycopodiella margueritae



Lycopodium annotinum



Lycopodium clavatum



Lycopodium dendroideum

Figure 9. Distribution maps for *Lycopodiella margueritae*, *Lycopodium annotinum*, *L. clavatum*, and *L. dendroideum*.

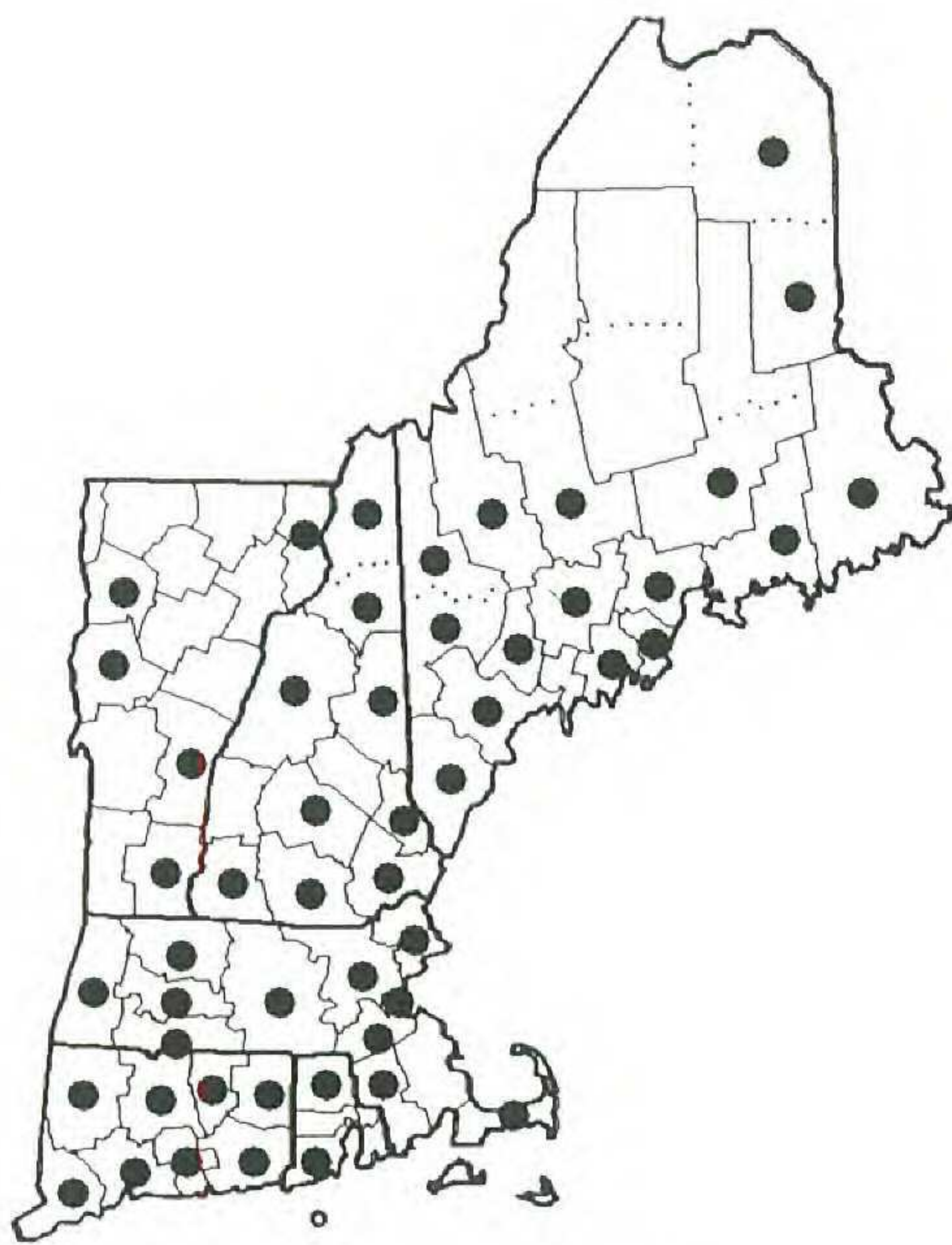
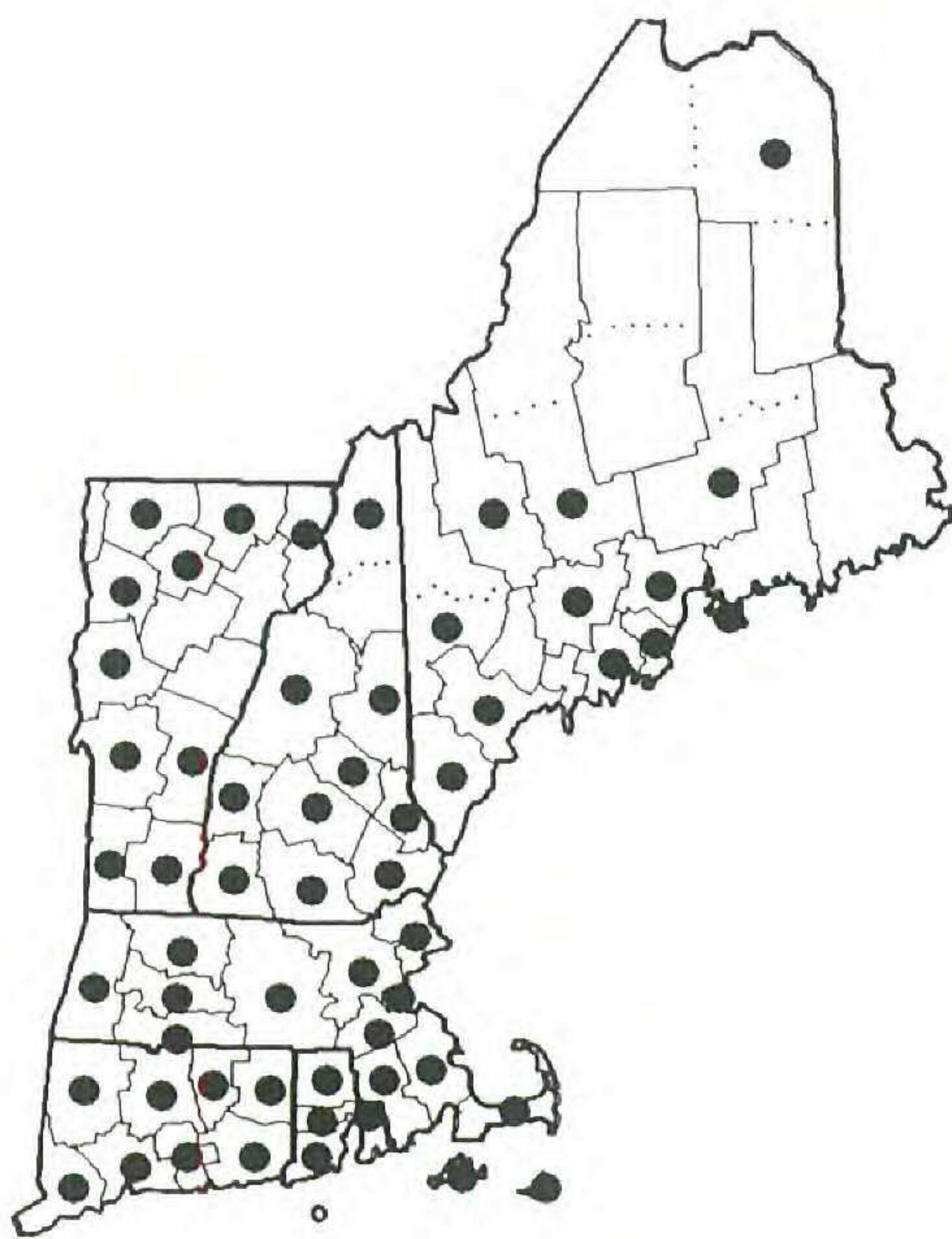
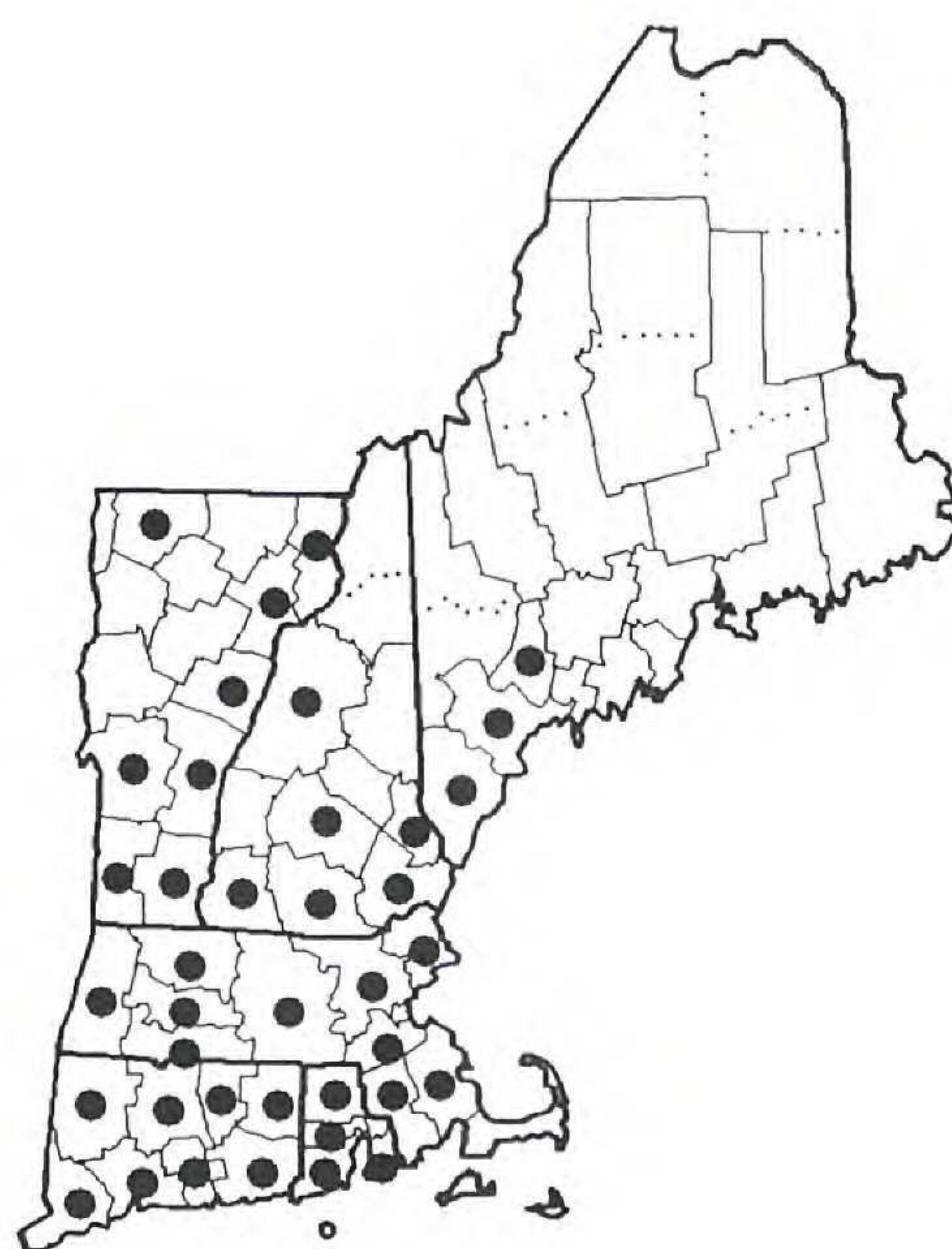
*Lycopodium hickeyi**Lycopodium lagopus**Lycopodium obscurum**Lycopodium dendroideum*
× *obscurum*

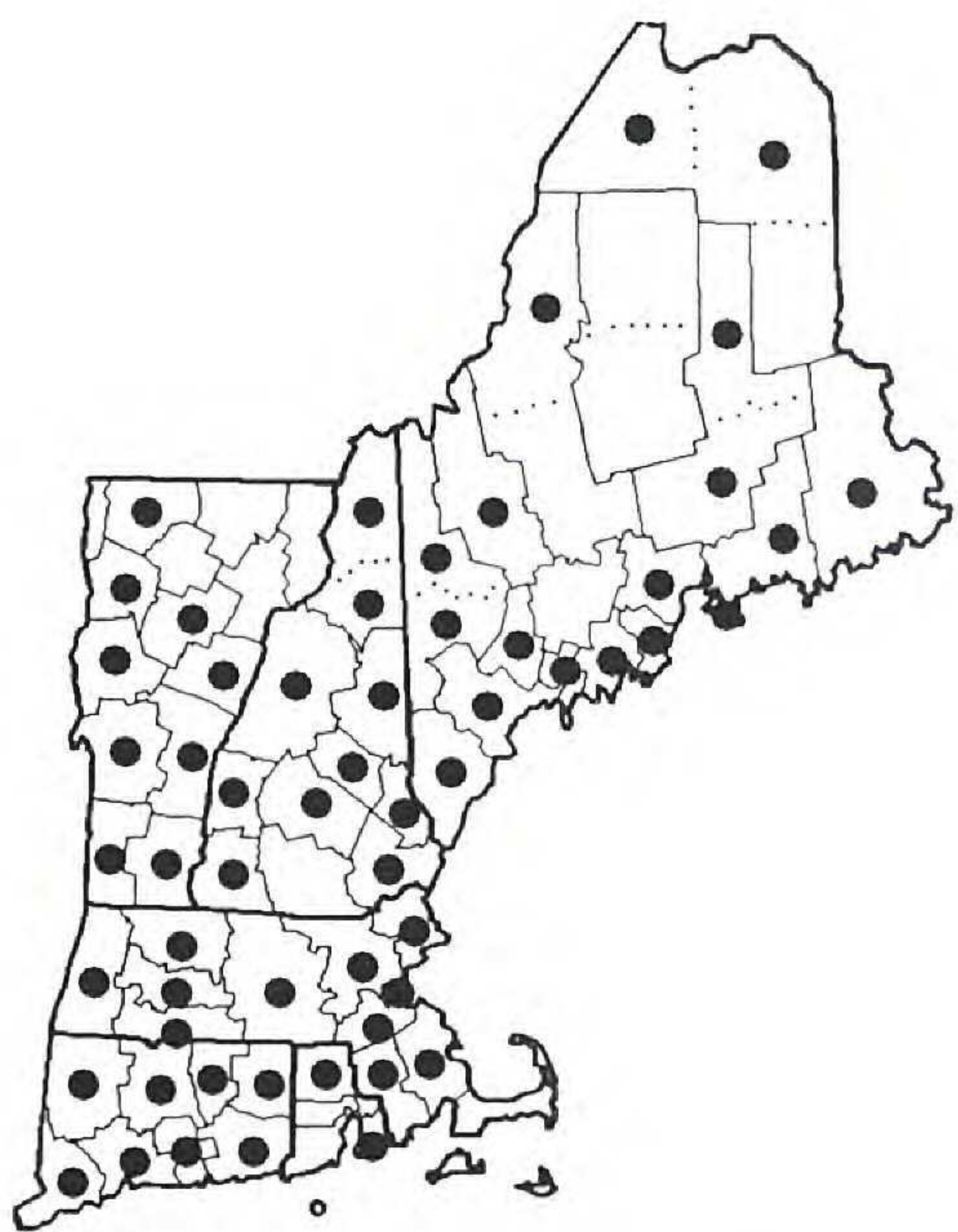
Figure 10. Distribution maps for *Lycopodium hickeyi*, *L. lagopus*, *L. obscurum*, and *L. dendroideum* × *L. obscurum*.



Pseudolycopodiella caroliniana



Selaginella apoda

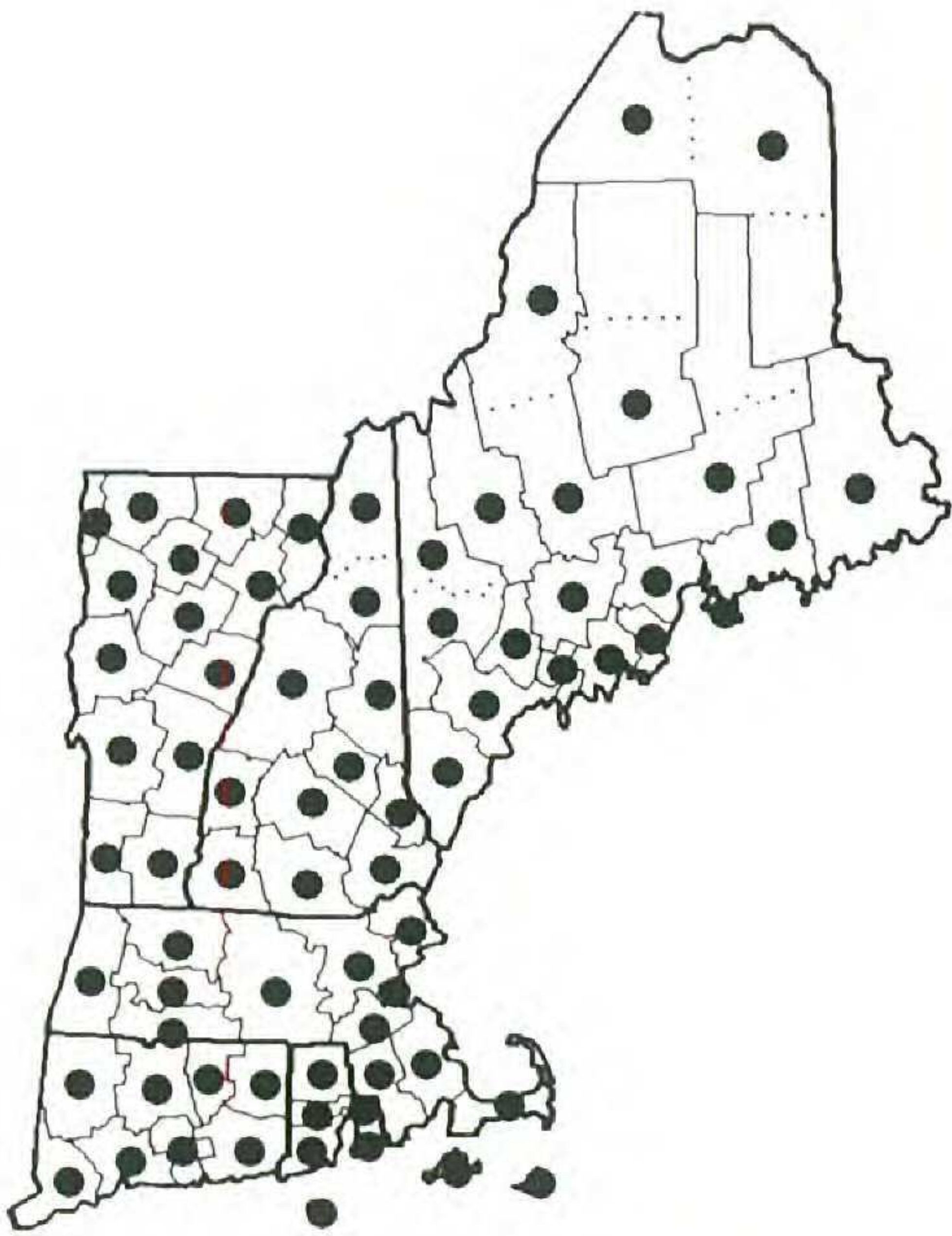


Selaginella rupestris

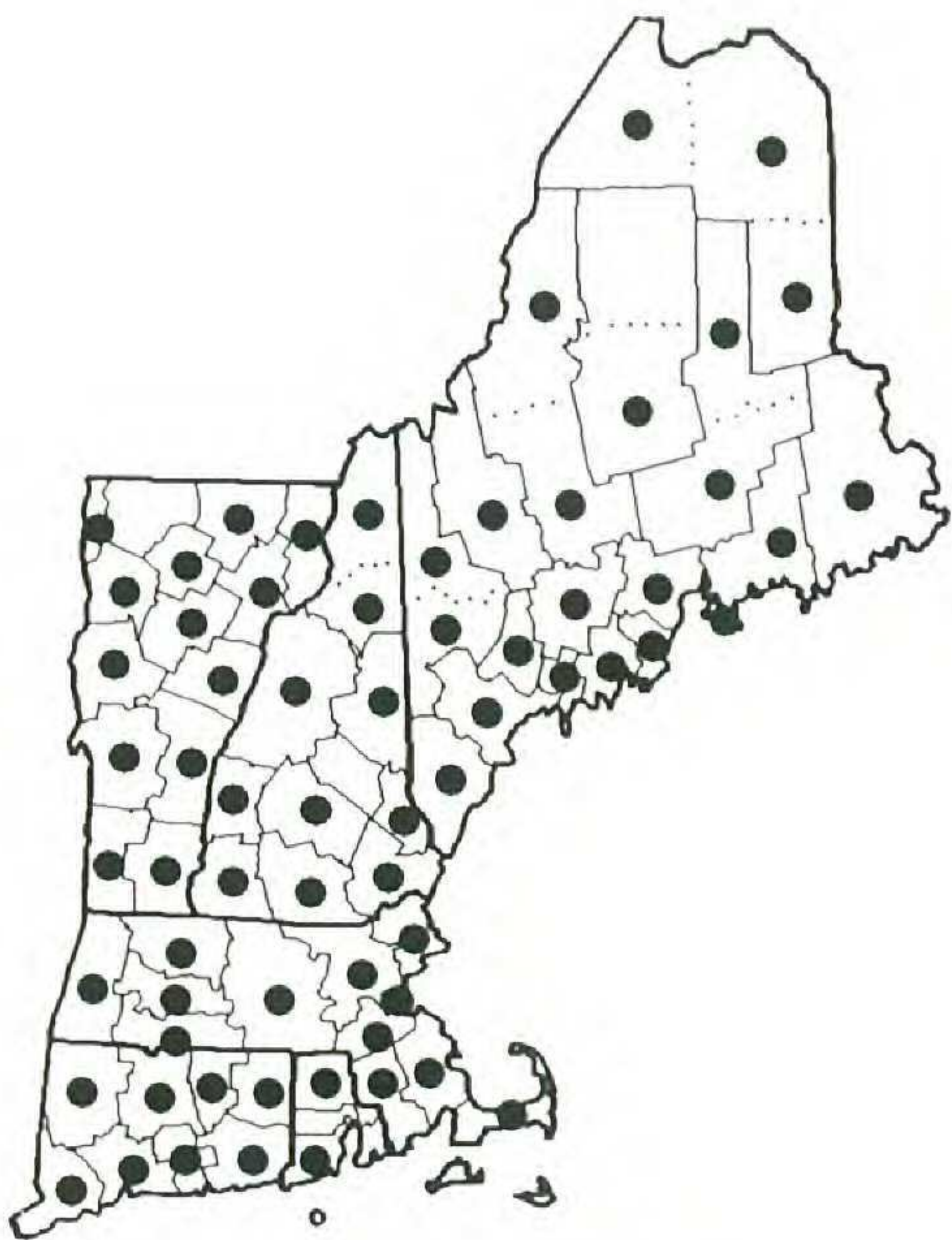


Selaginella selaginoides

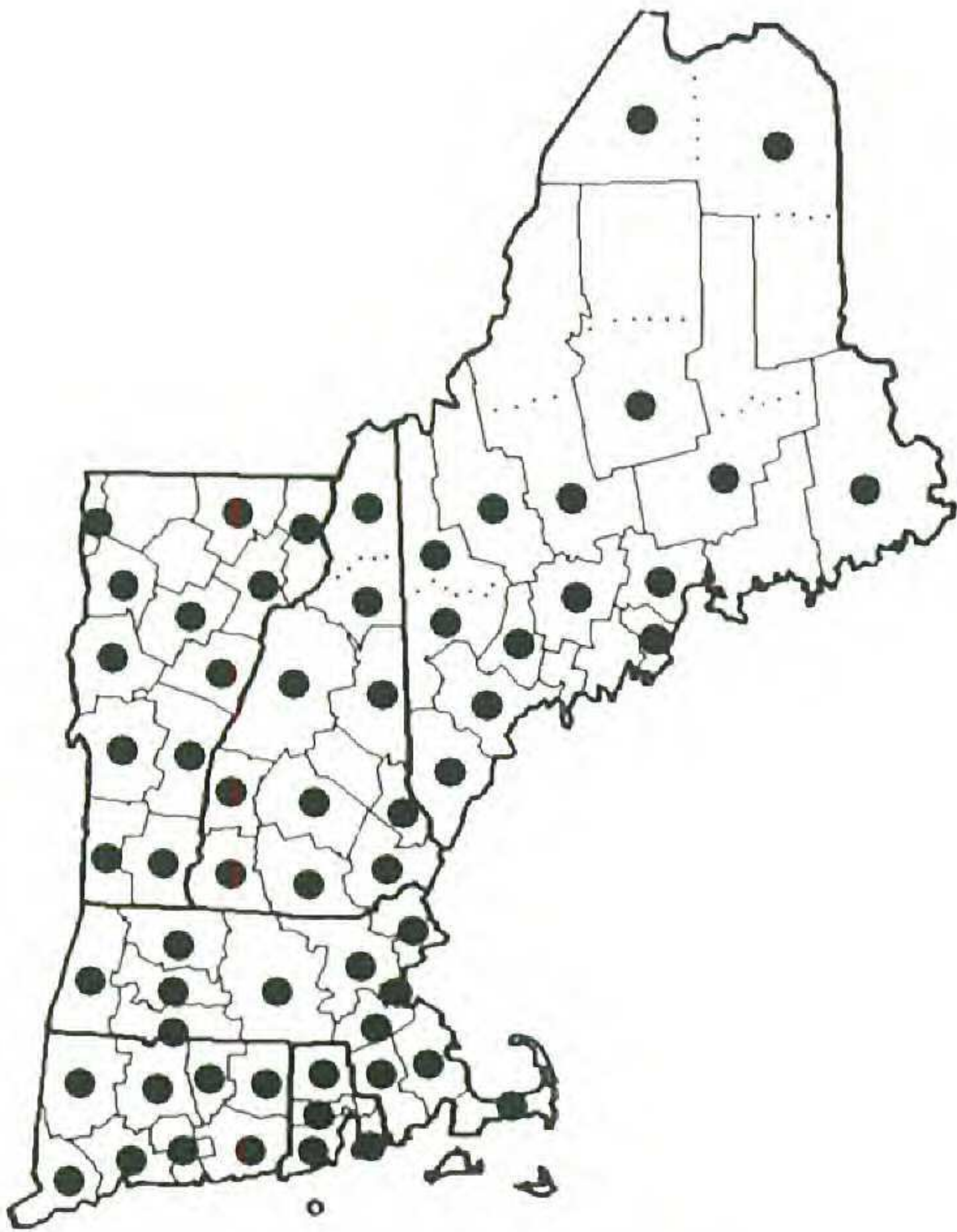
Figure 11. Distribution maps for *Pseudolycopodiella caroliniana*, *Selaginella apoda*, *S. rupestris*, and *S. selaginoides*.



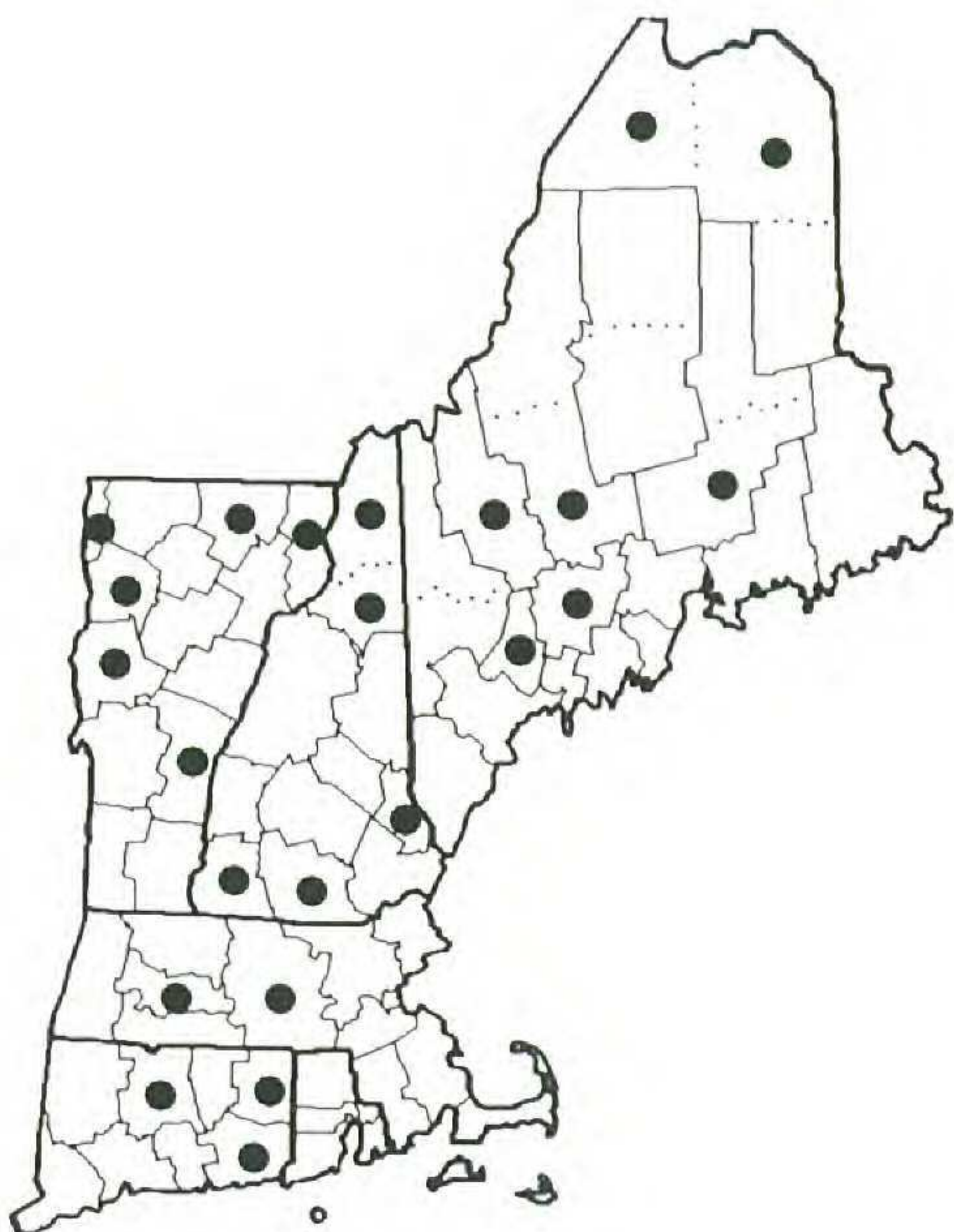
Equisetum arvense



Equisetum fluviatile

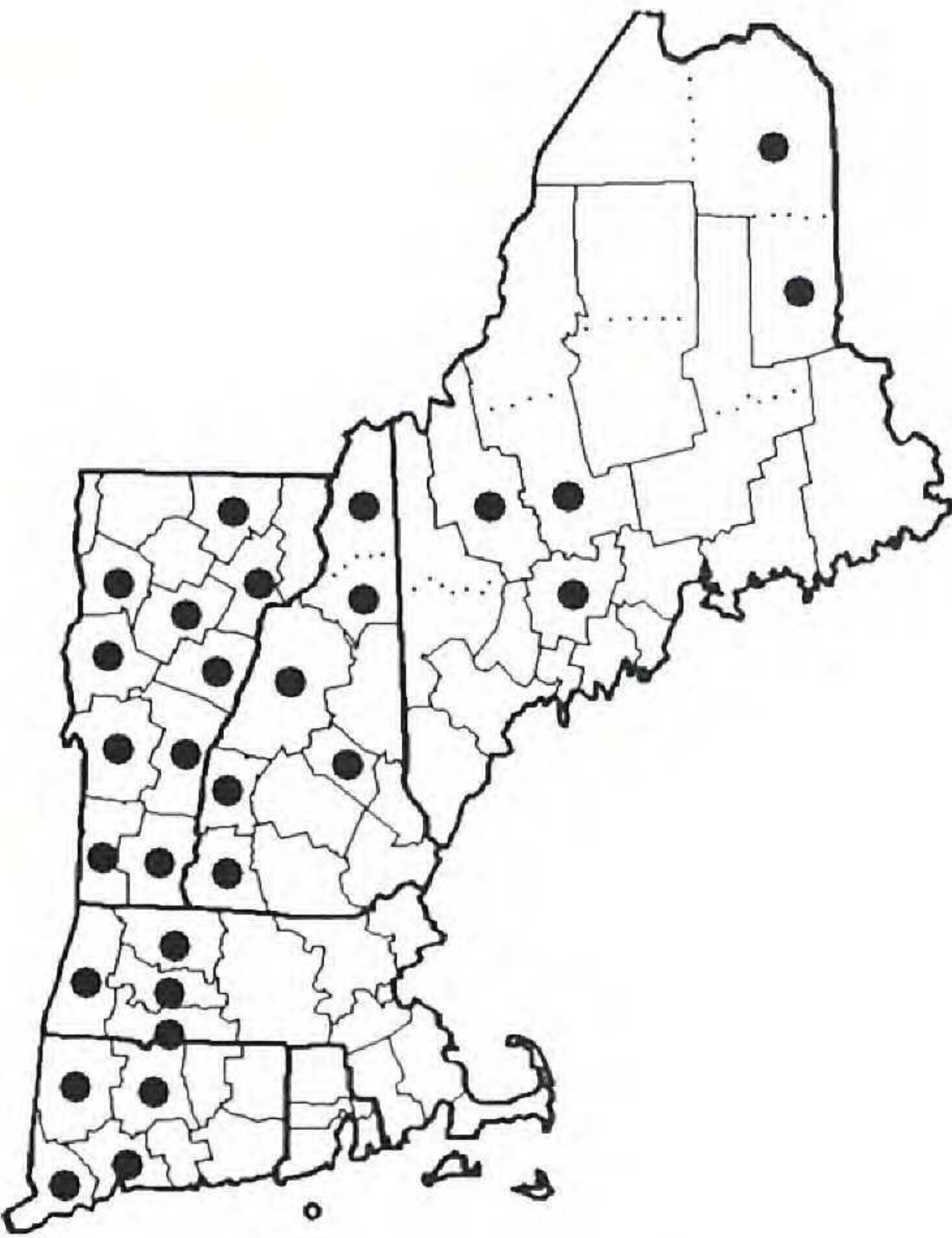


Equisetum hyemale
subsp. *affine*

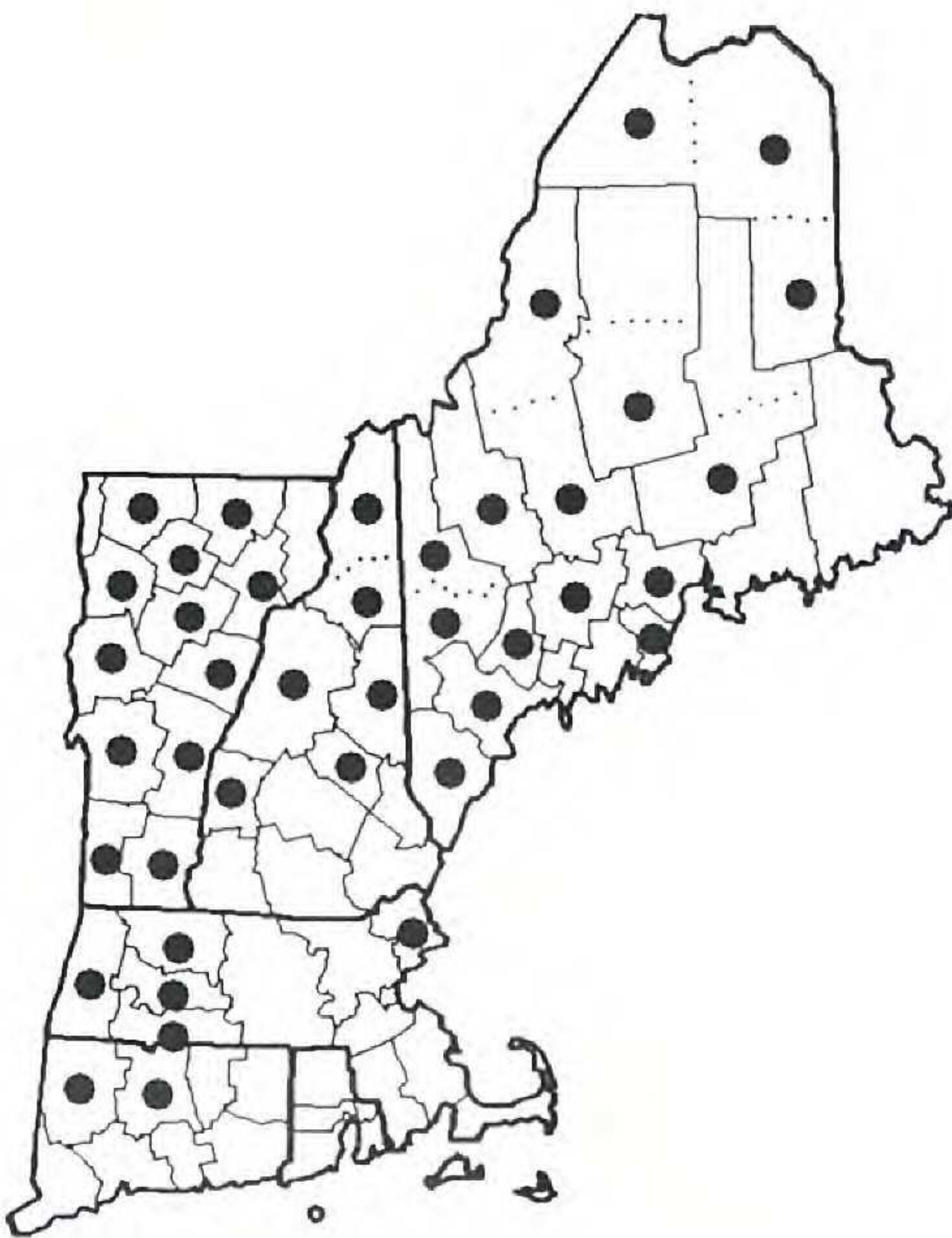


Equisetum palustre

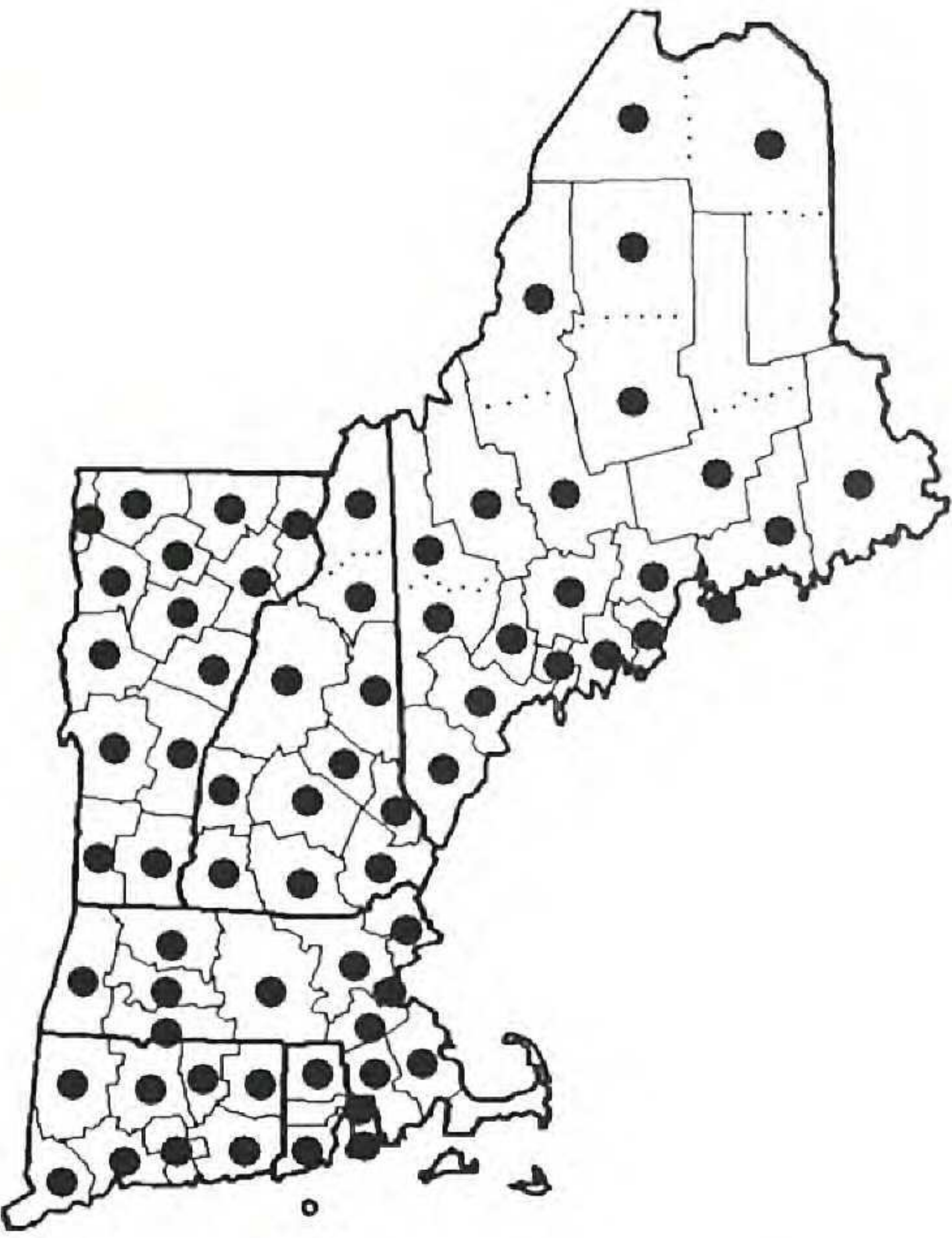
Figure 12. Distribution maps for *Equisetum arvense*, *E. fluviatile*, *E. hyemale* subsp. *affine*, and *E. palustre*.



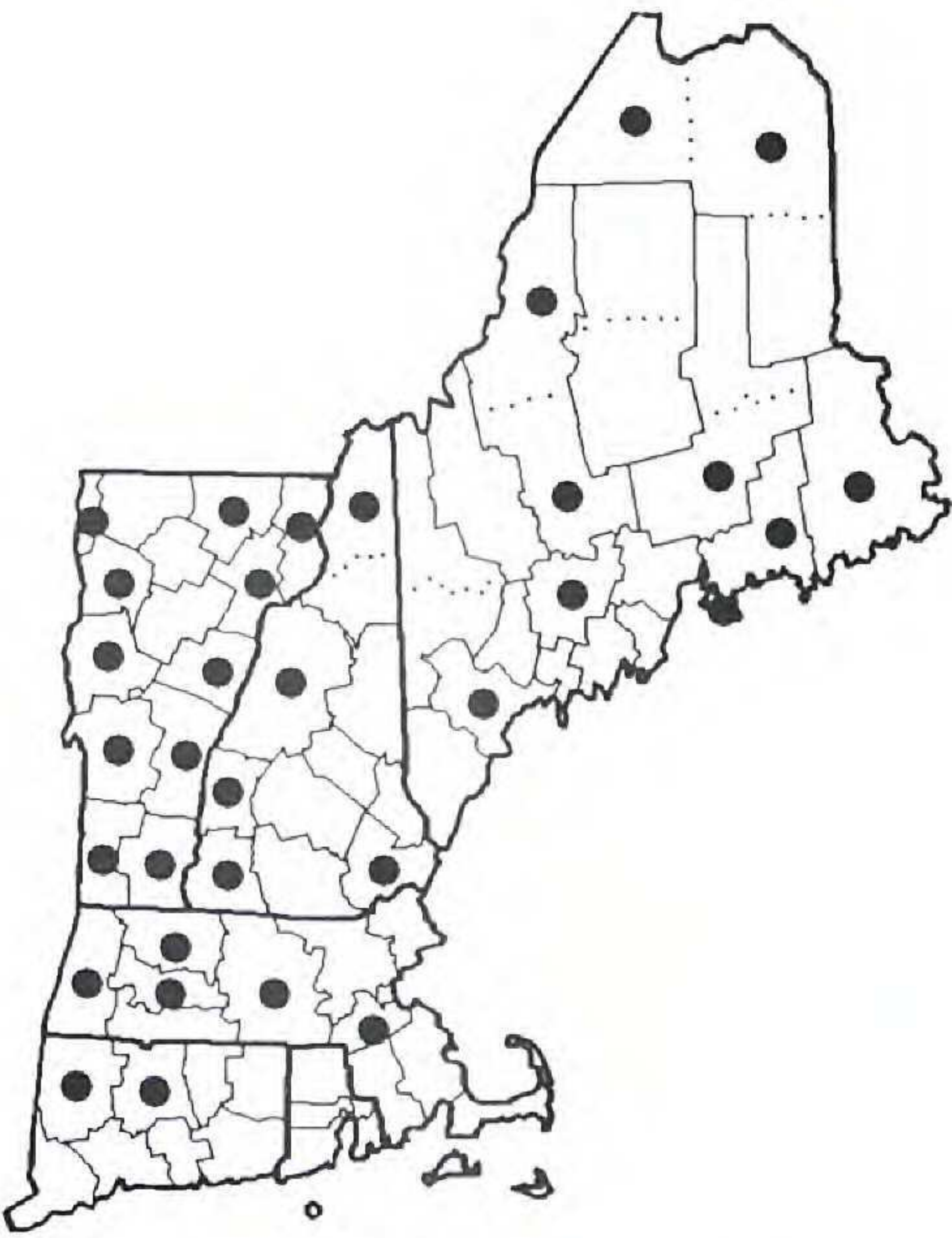
Equisetum pratense



Equisetum scirpoides



Equisetum sylvaticum



Equisetum variegatum

Figure 13. Distribution maps for *Equisetum pratense*, *E. scirpoides*, *E. sylvaticum*, and *E. variegatum*.

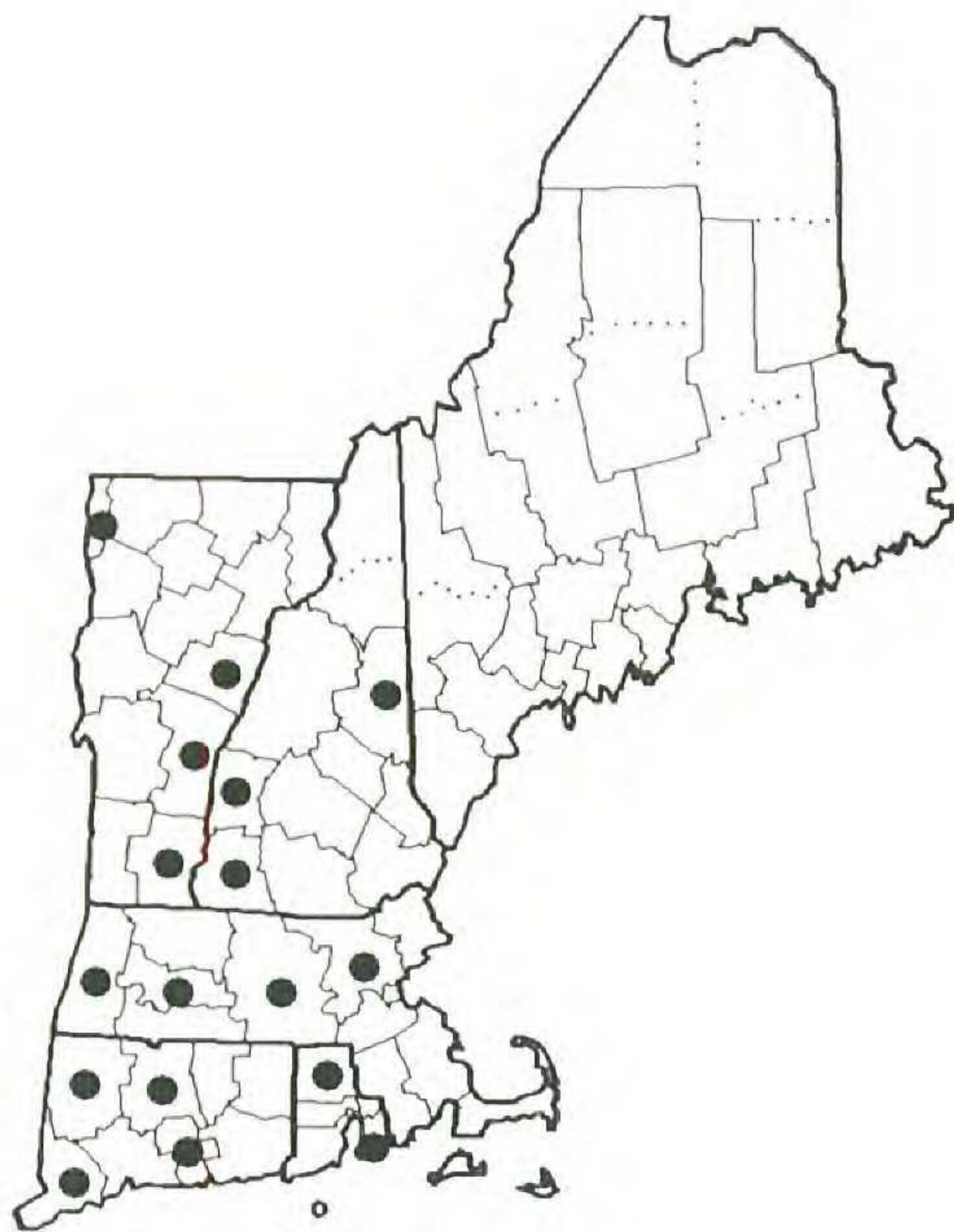
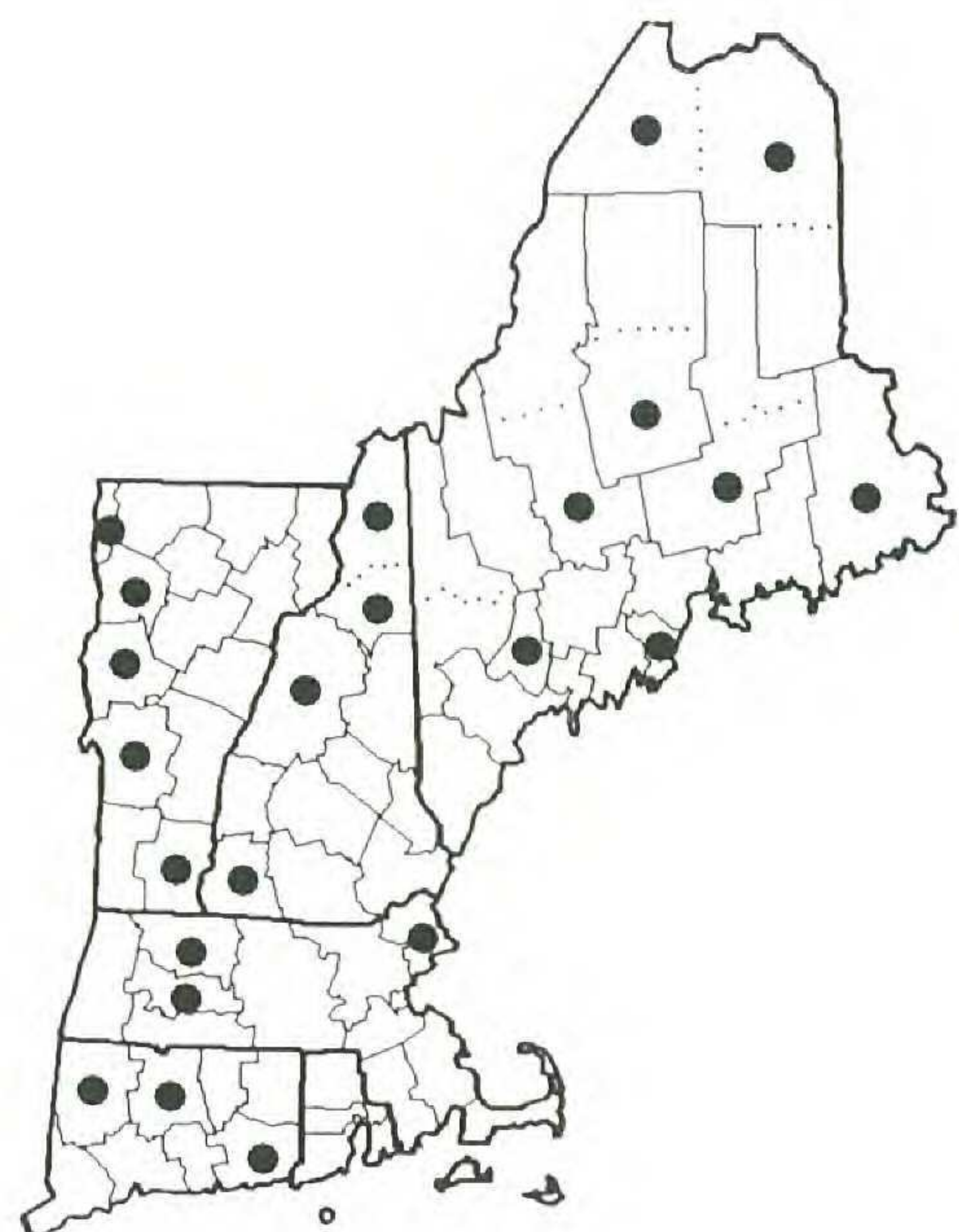
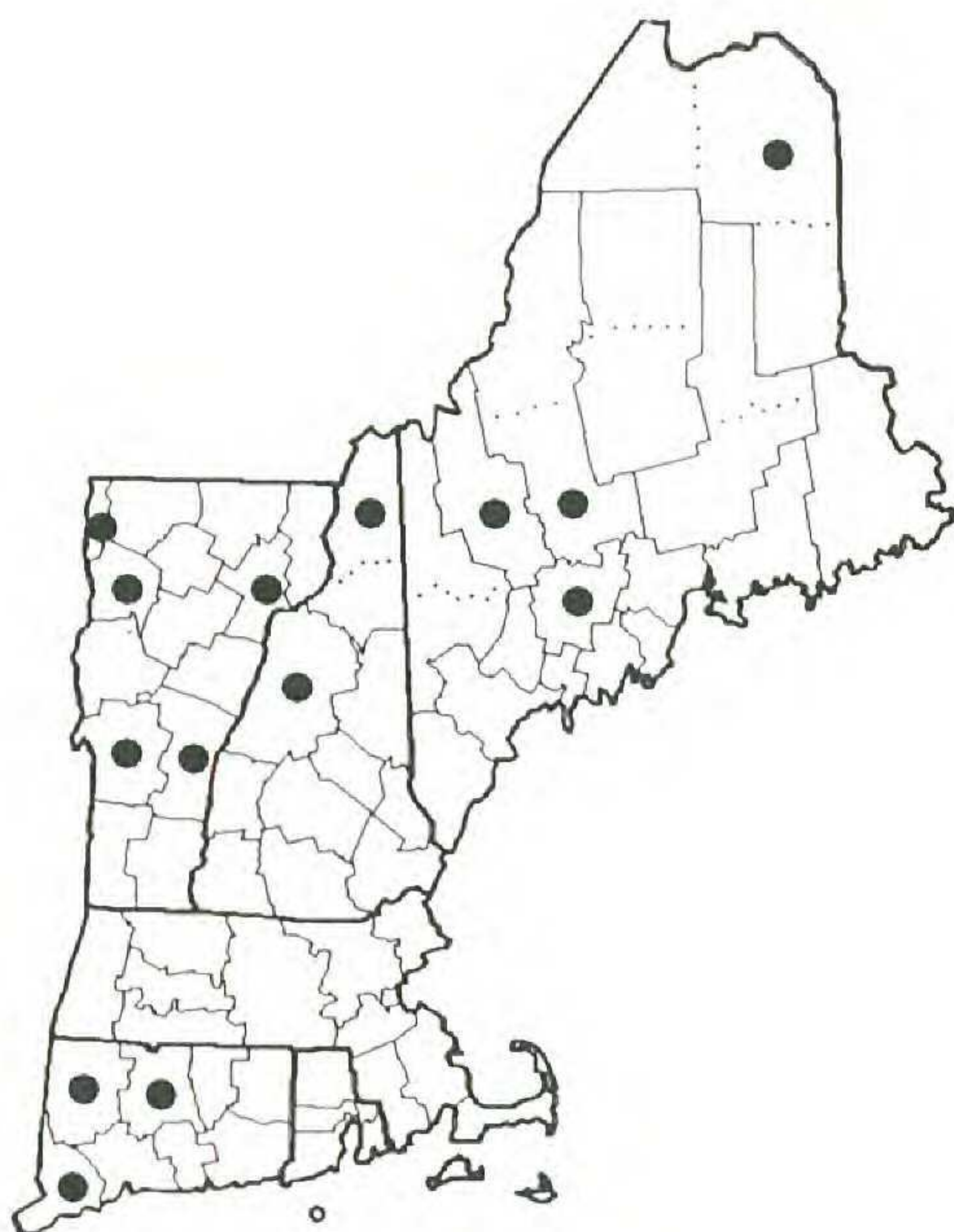
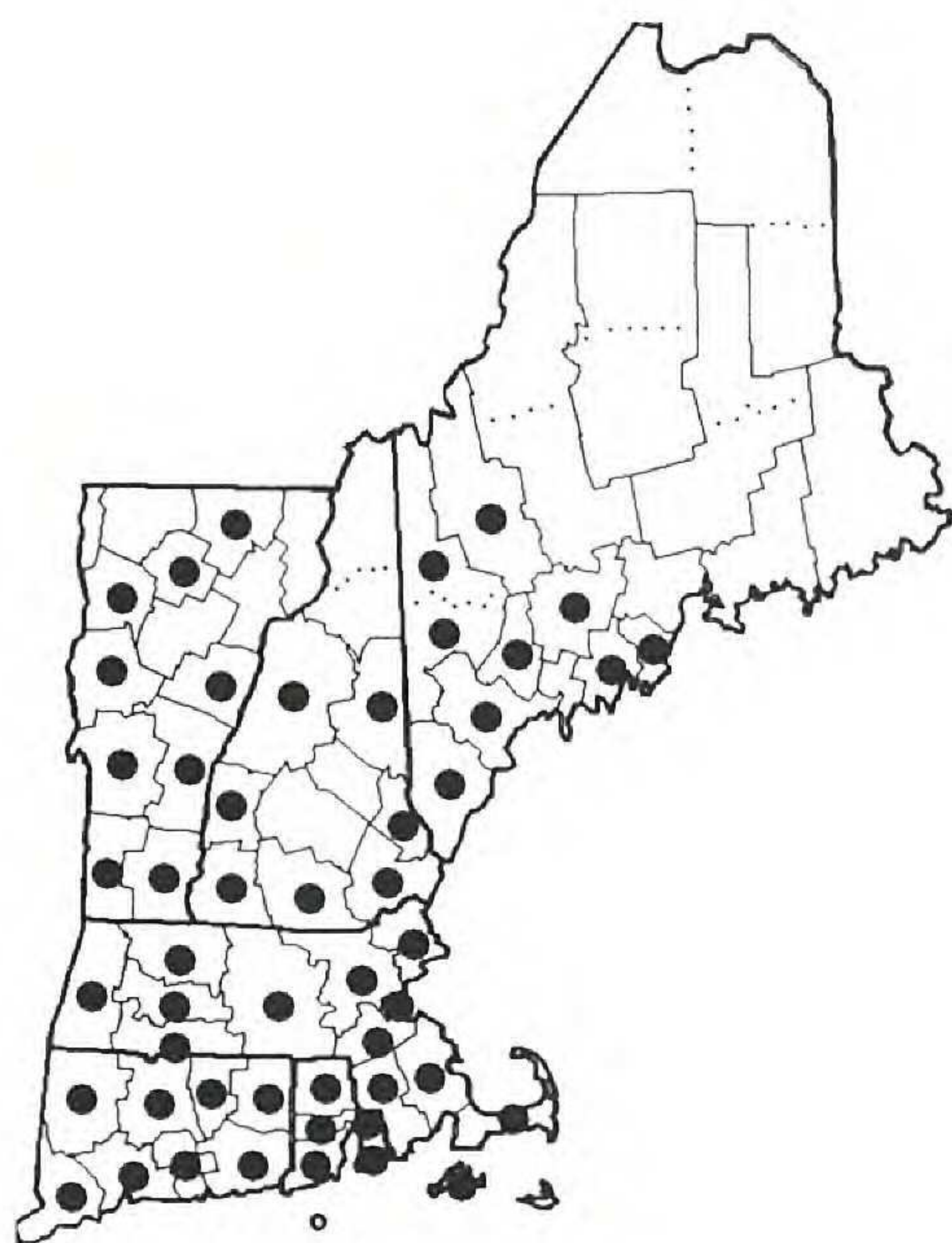
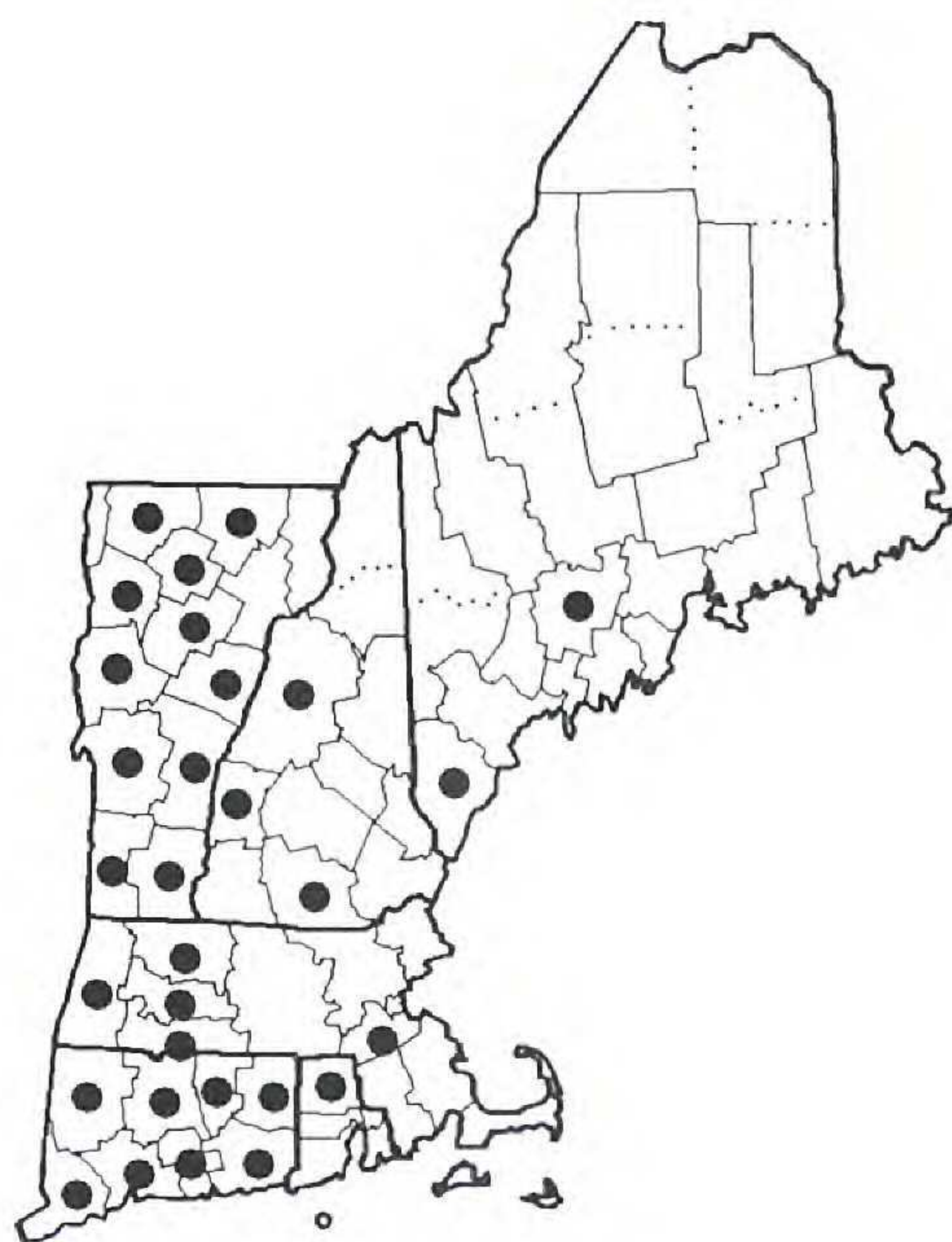
*Equisetum x ferrissii**Equisetum x litorale**Equisetum x mackaii**Asplenium montanum*

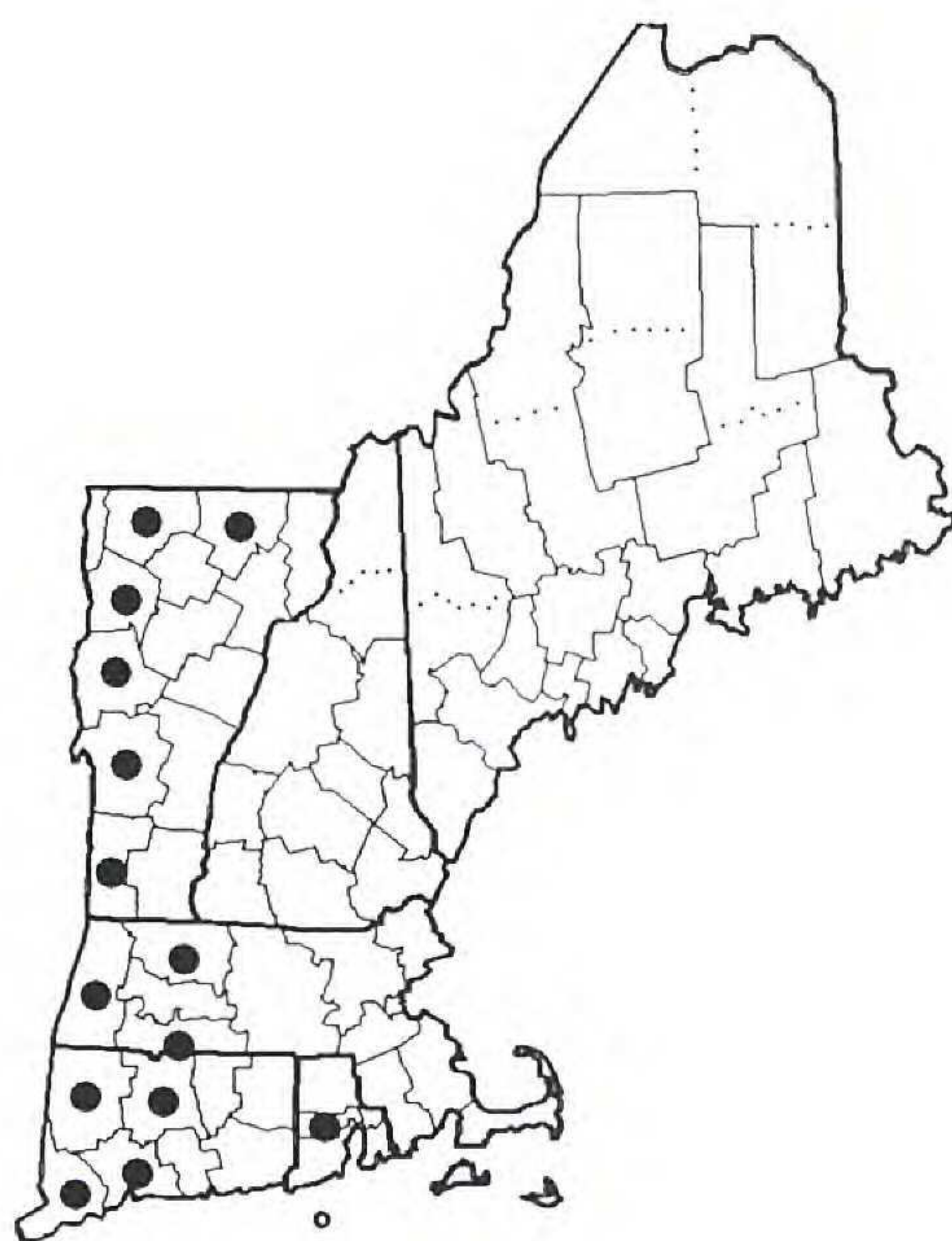
Figure 14. Distribution maps for *Equisetum x ferrissii*, *E. x litorale*, *E. x mackaii*, and *Asplenium montanum*.



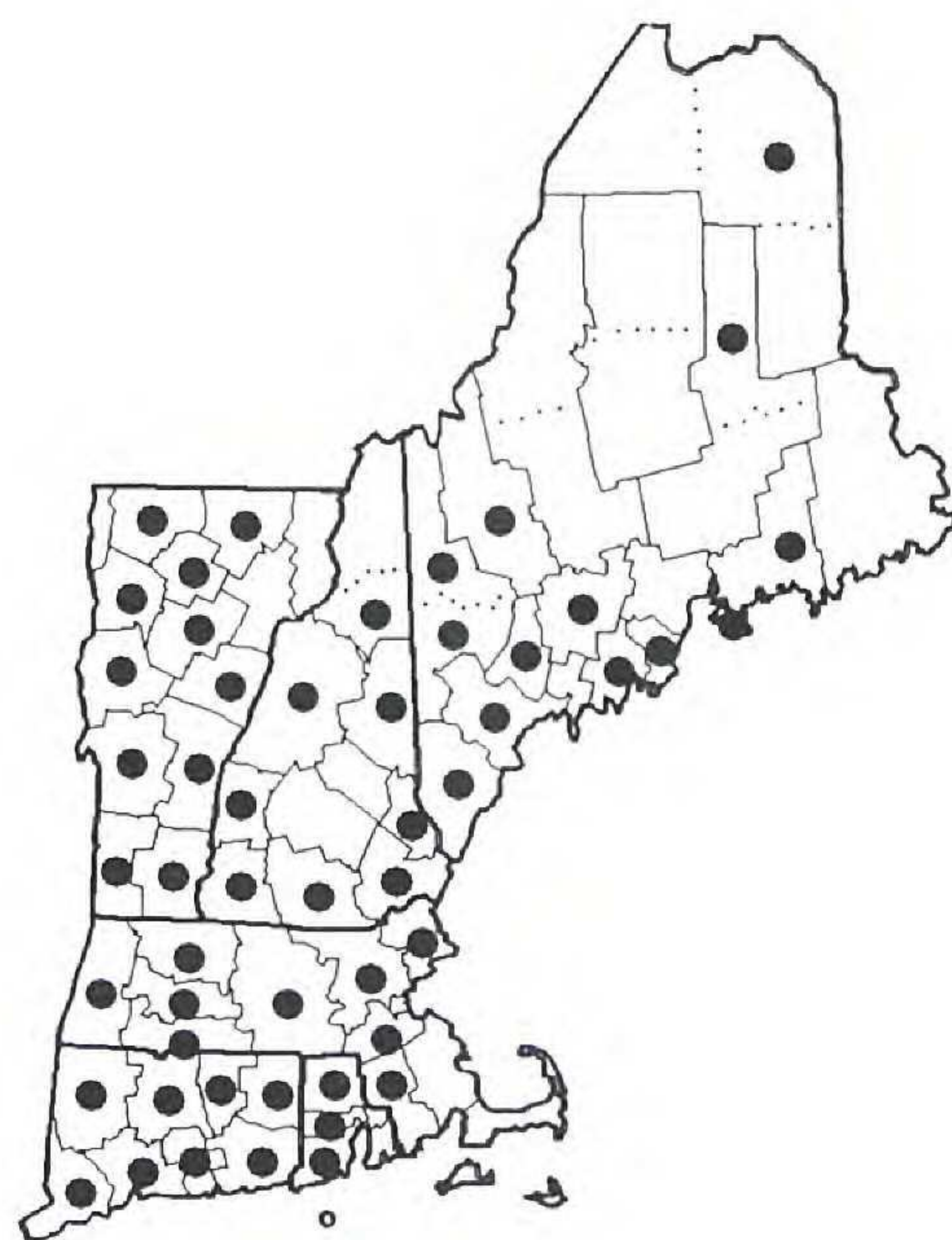
Asplenium platyneuron



Asplenium rhizophyllum

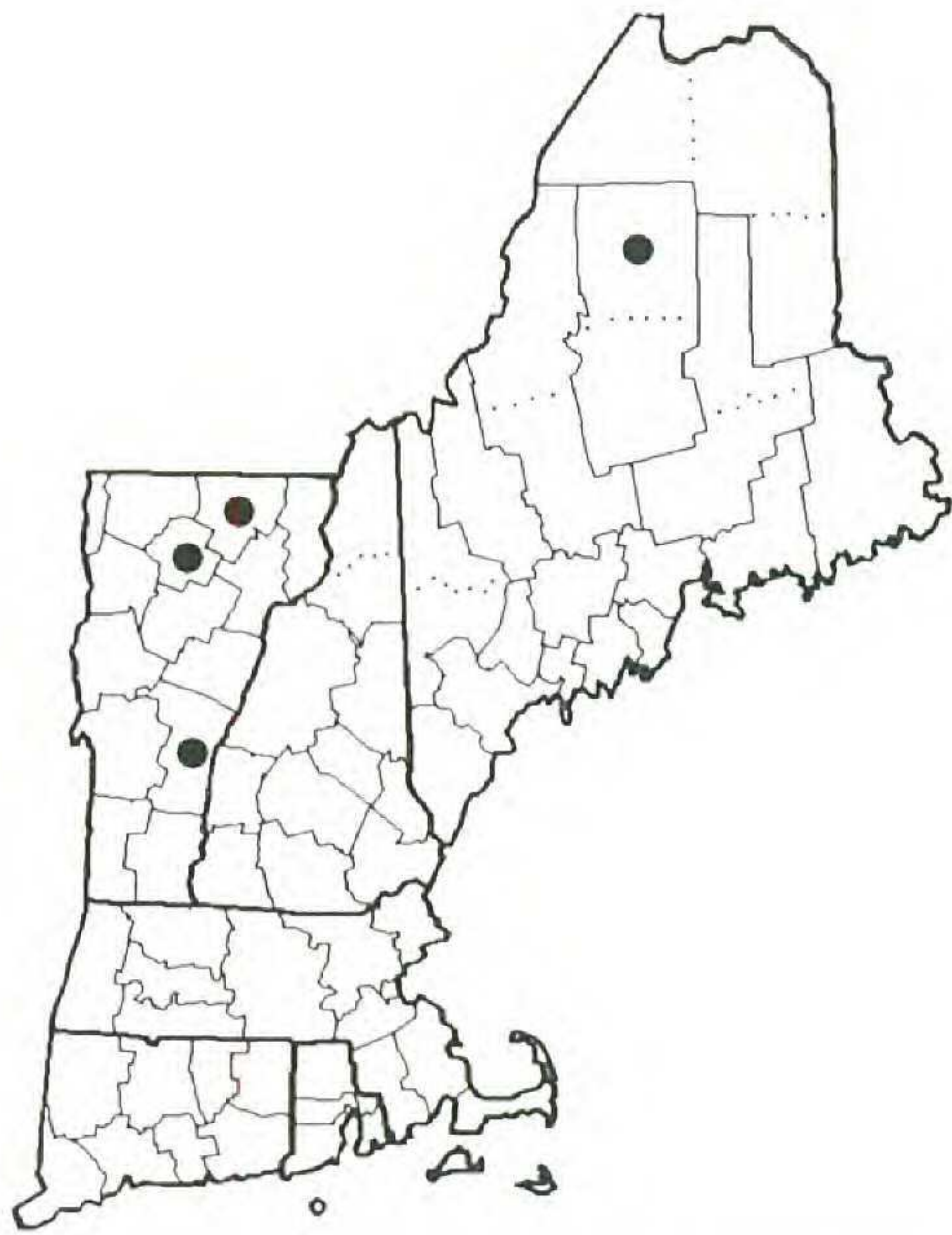


Asplenium ruta-muraria



Asplenium trichomanes

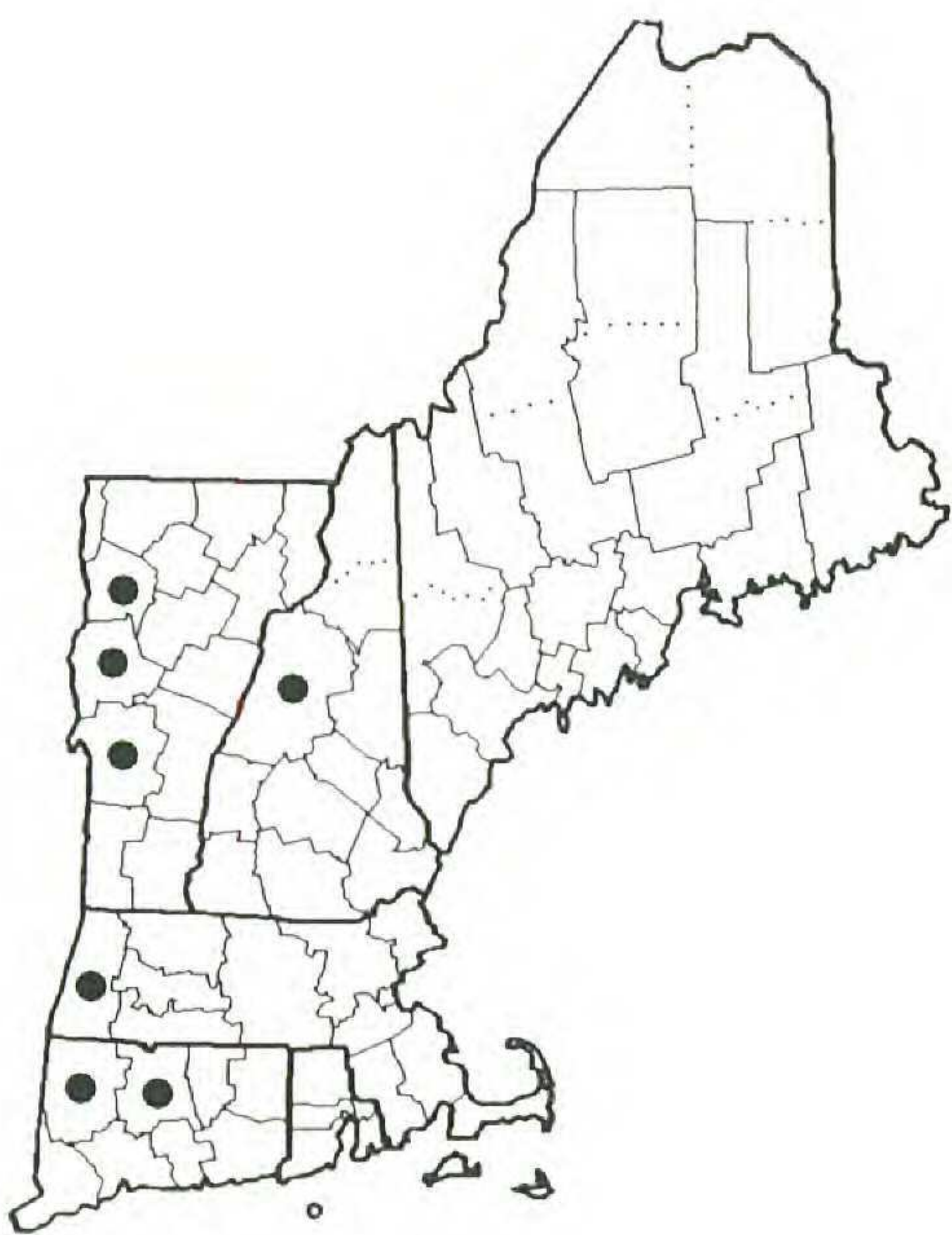
Figure 15. Distribution maps for *Asplenium platyneuron*, *A. rhizophyllum*, *A. ruta-muraria*, and *A. trichomanes*.



Asplenium trichomanes-ramosum



Asplenium x clermontae



Asplenium x ebenoides

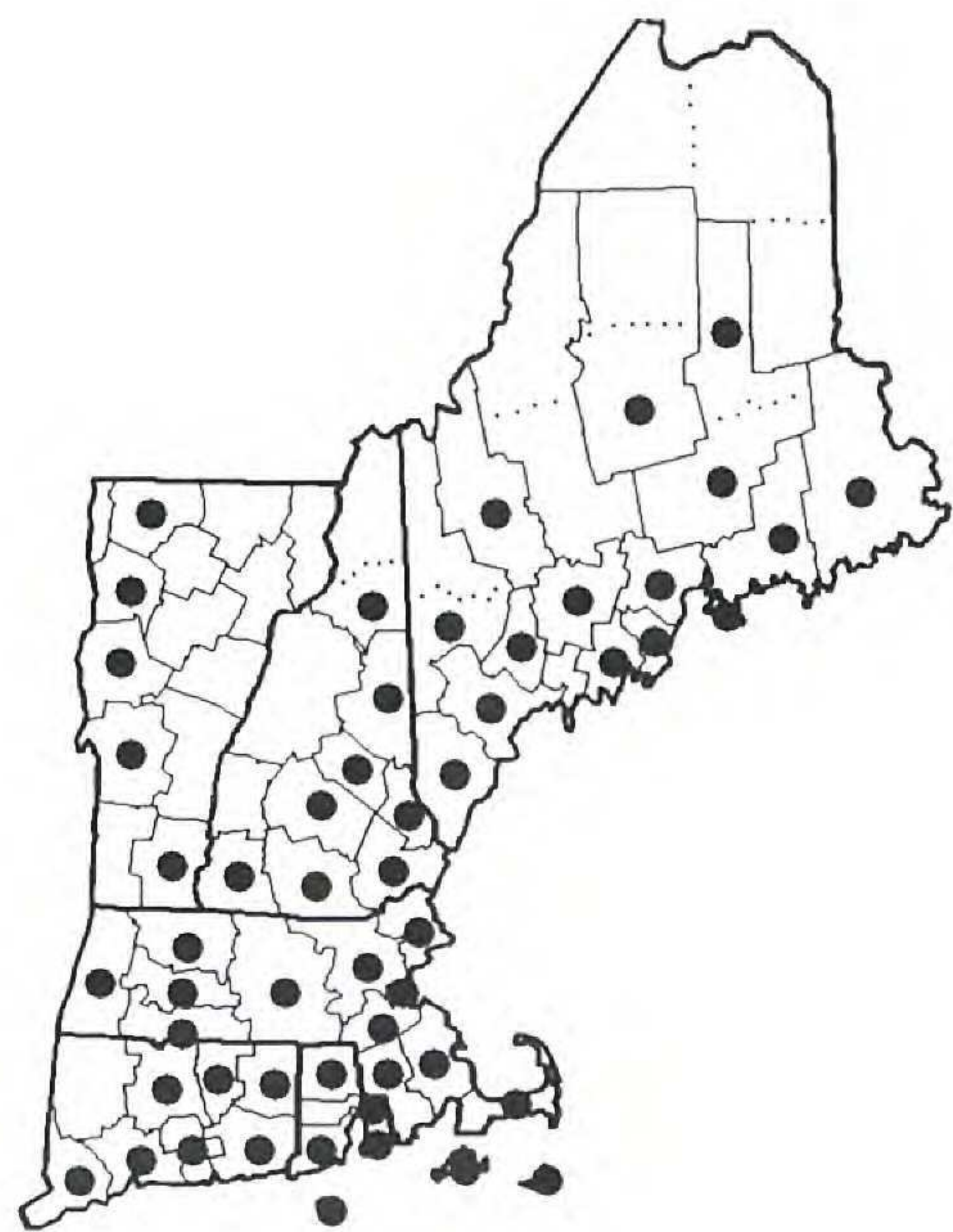


AZOLLA CAROLINIANA

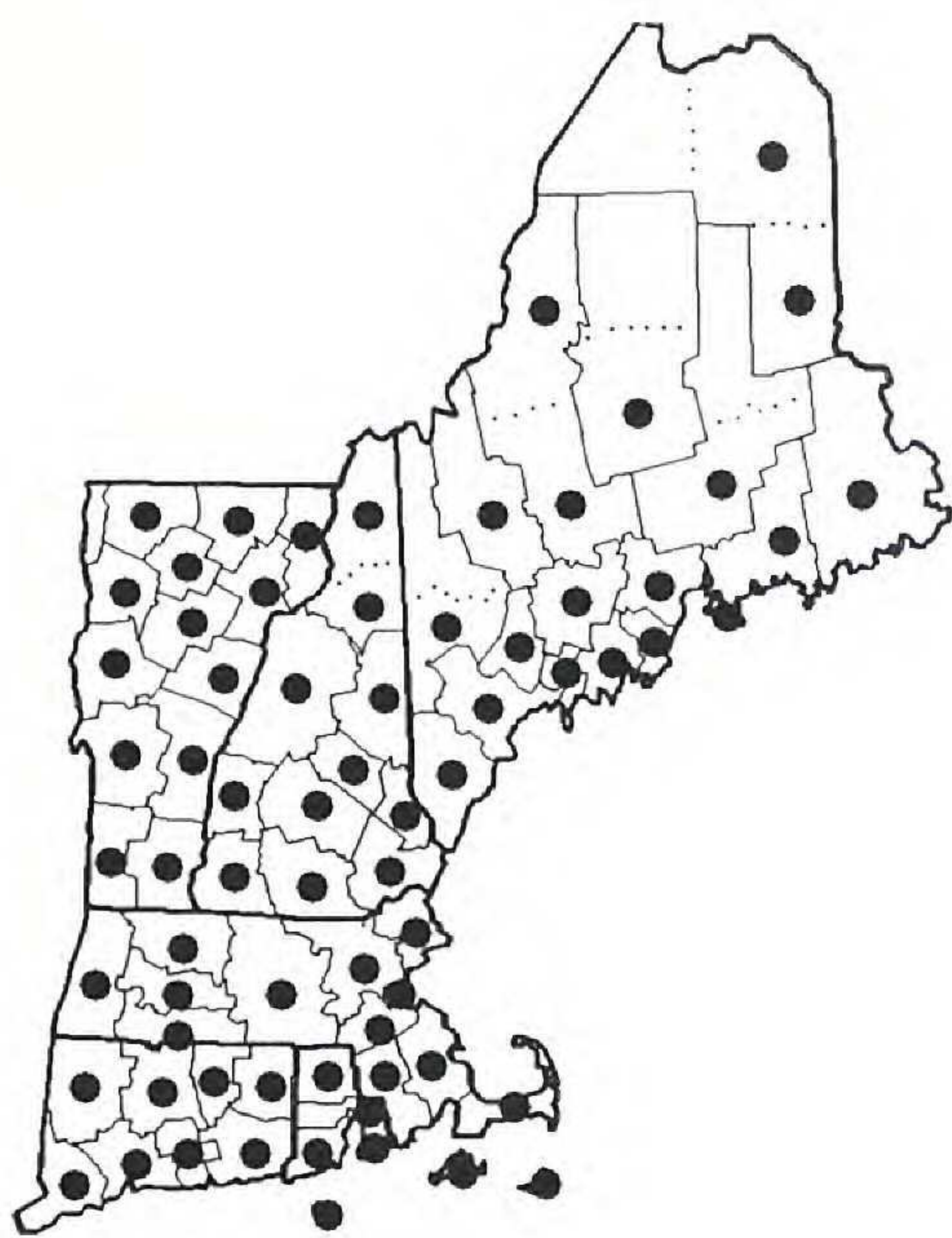
Figure 16. Distribution maps for *Asplenium trichomanes-ramosum*, *A. x clermontae*, *A. x ebenoides*, and *AZOLLA CAROLINIANA*.



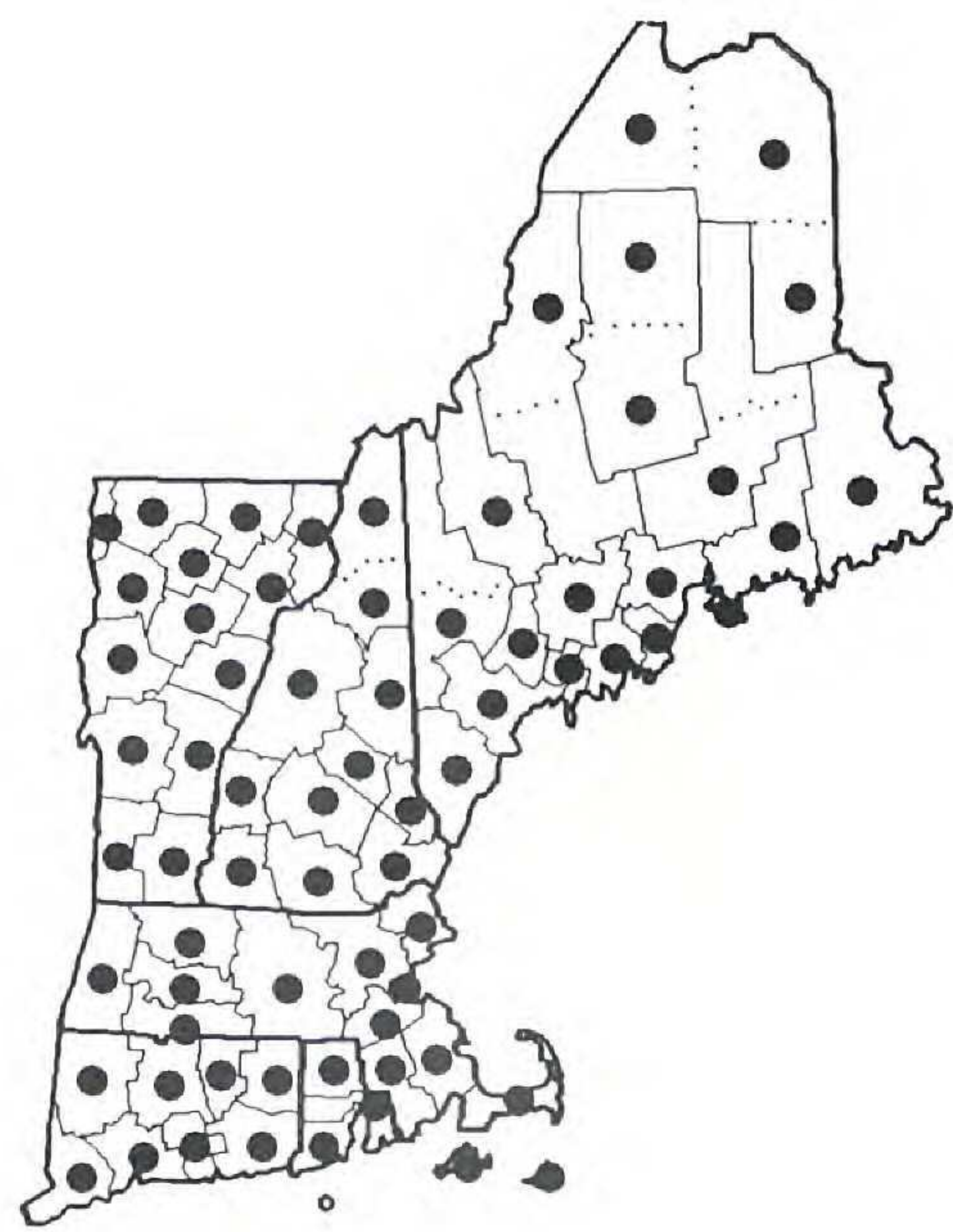
Woodwardia areolata



Woodwardia virginica



Dennstaedtia punctilobula

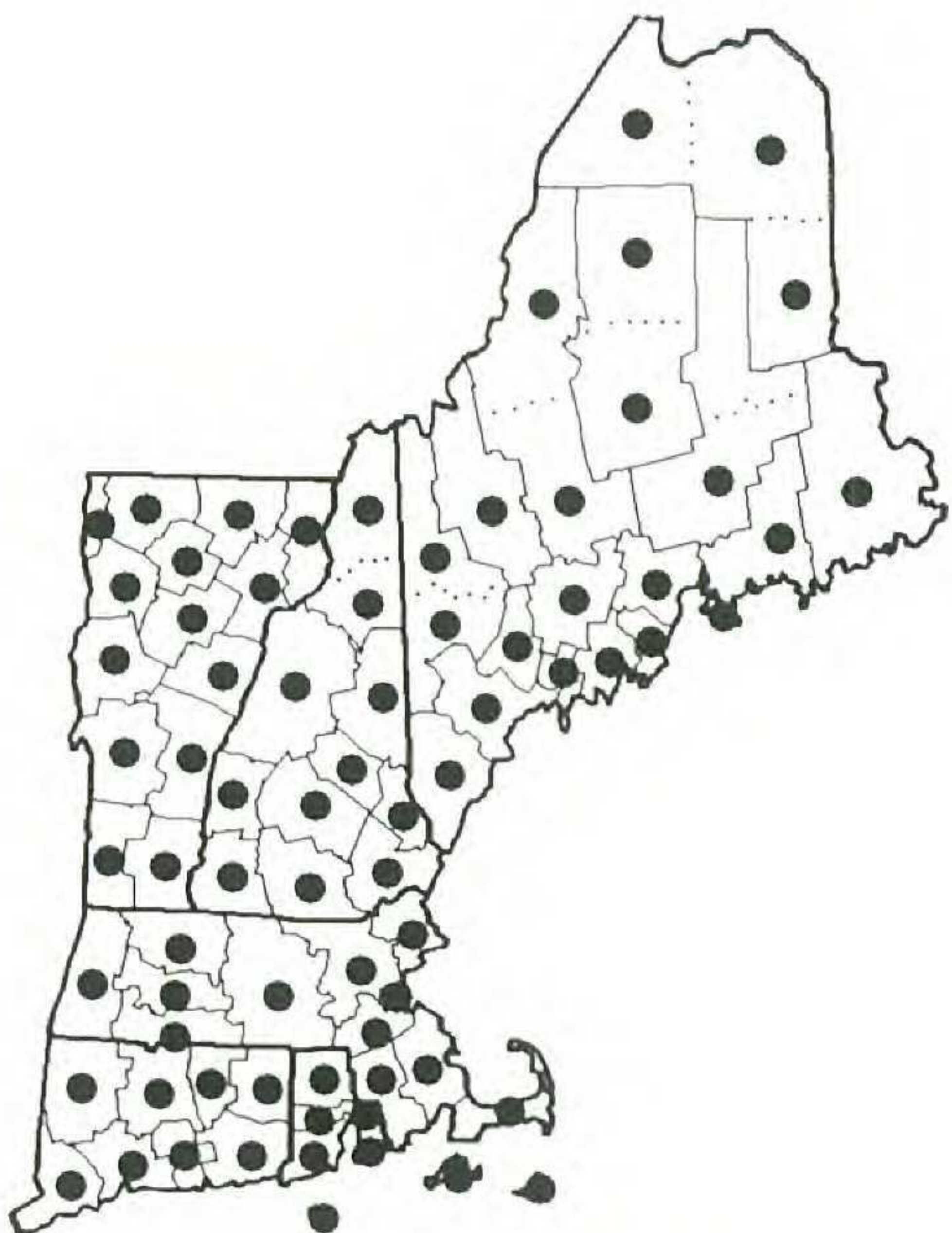


Pteridium aquilinum
subsp. *latiusculum*

Figure 17. Distribution maps for *Woodwardia areolata*, *W. virginica*, *Dennstaedtia punctilobula*, and *Pteridium aquilinum* subsp. *latiusculum*.



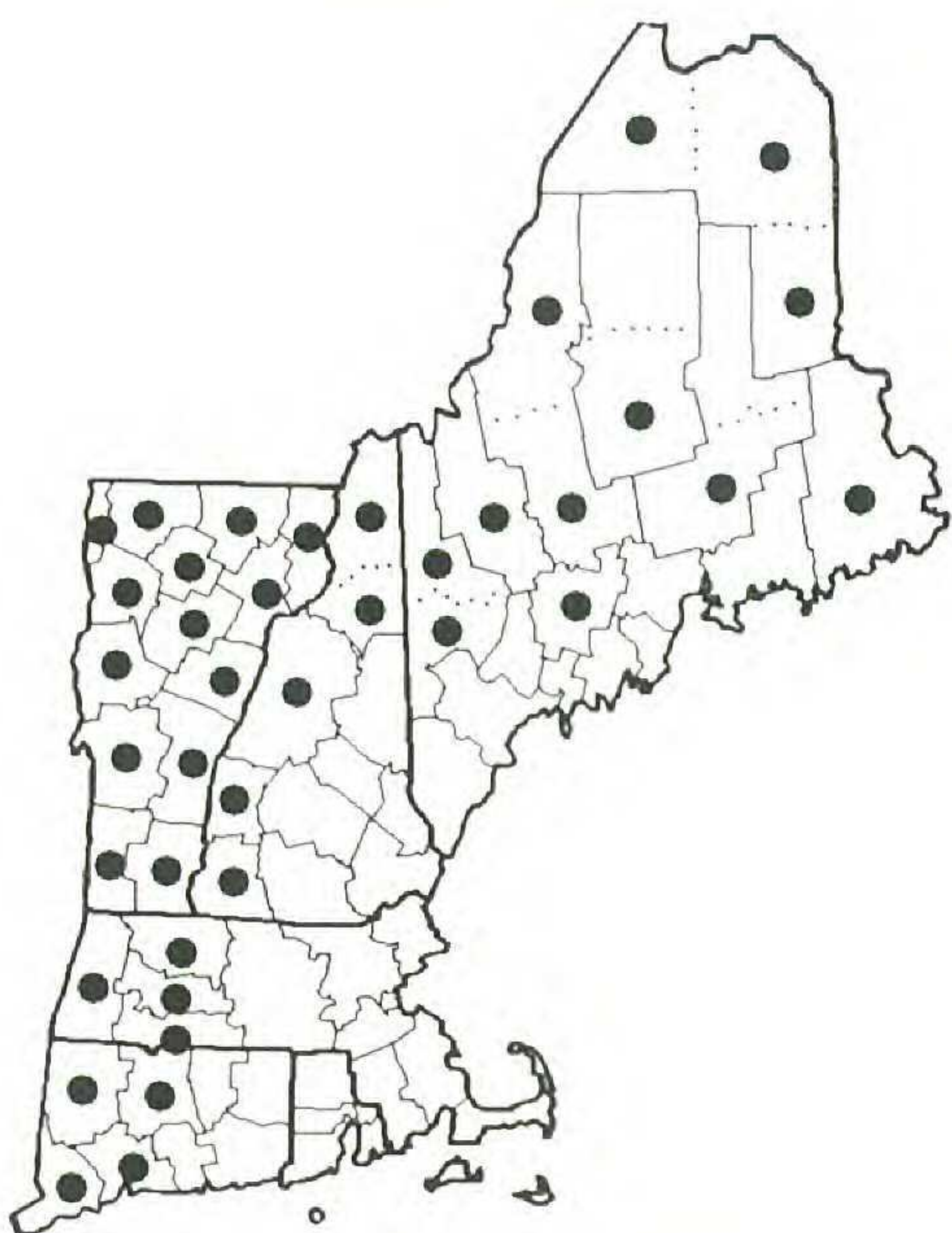
Pteridium aquilinum
subsp. *pseudocaudatum*



Athyrium filix-femina
subsp. *angustum*

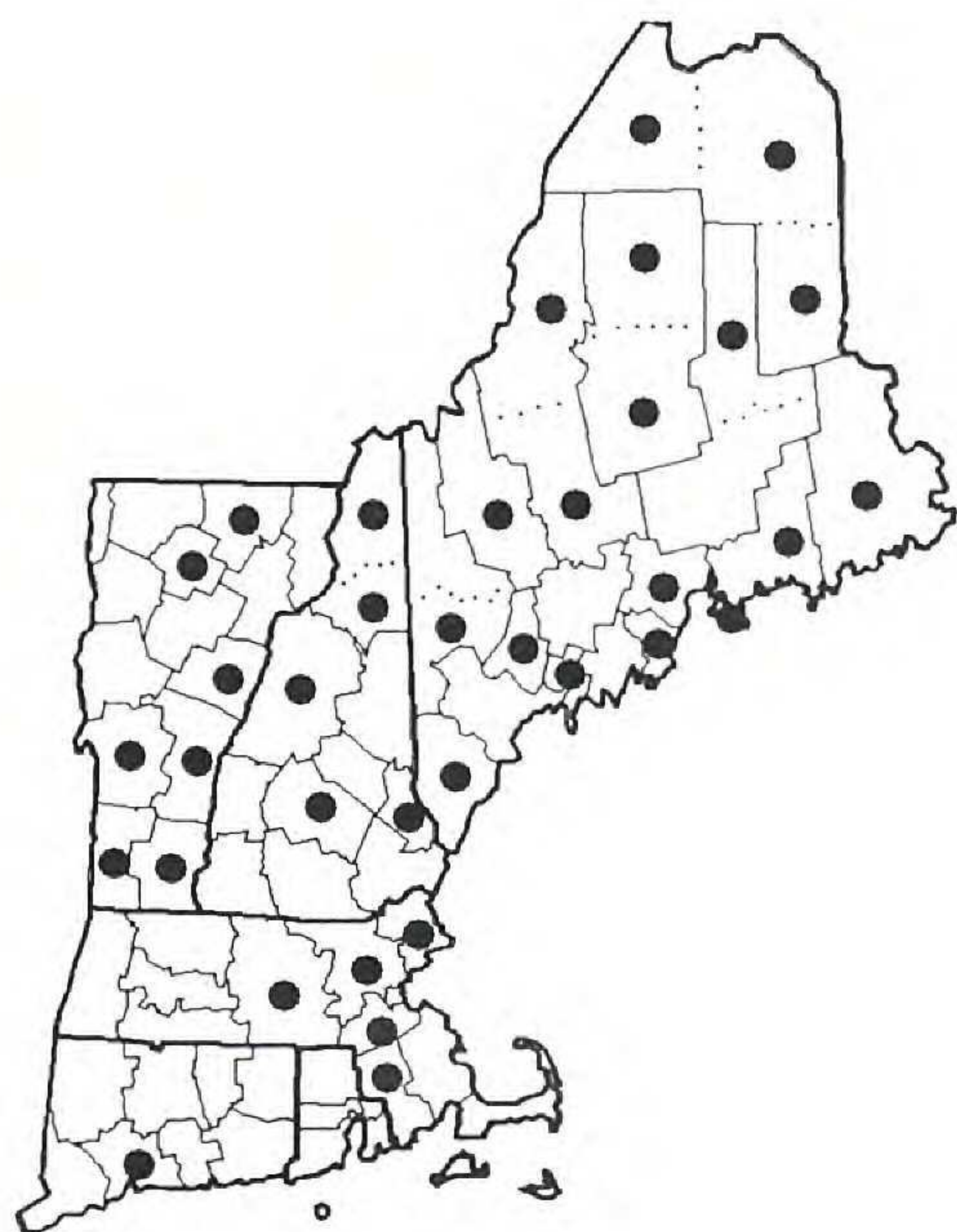


Athyrium filix-femina
subsp. *asplenioides*



Cystopteris bulbifera

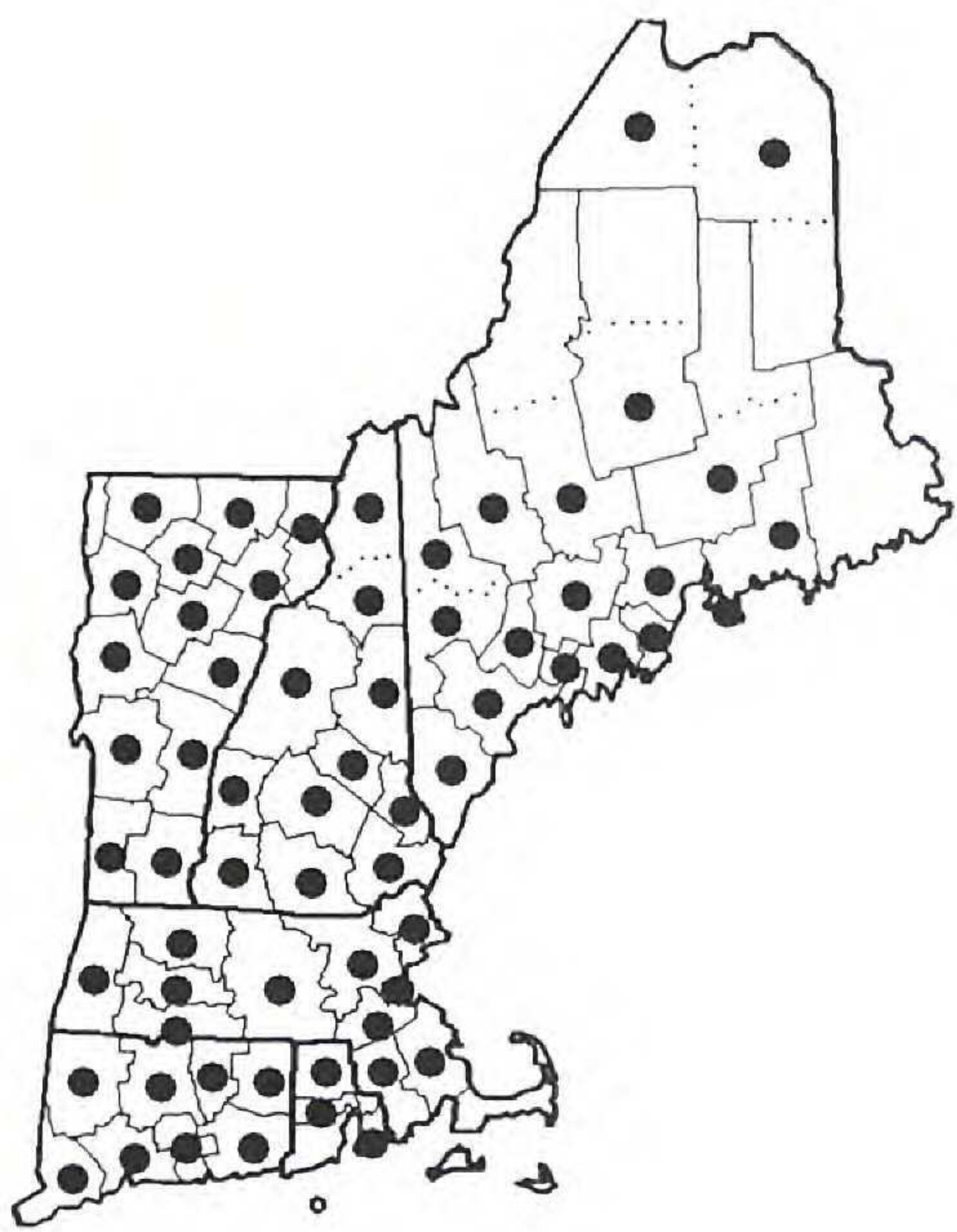
Figure 18. Distribution maps for *Pteridium aquilinum* subsp. *pseudocaudatum*, *Athyrium filix-femina* subsp. *angustum*, *A. filix-femina* subsp. *asplenioides*, and *Cystopteris bulbifera*.



Cystopteris fragilis



Cystopteris protrusa

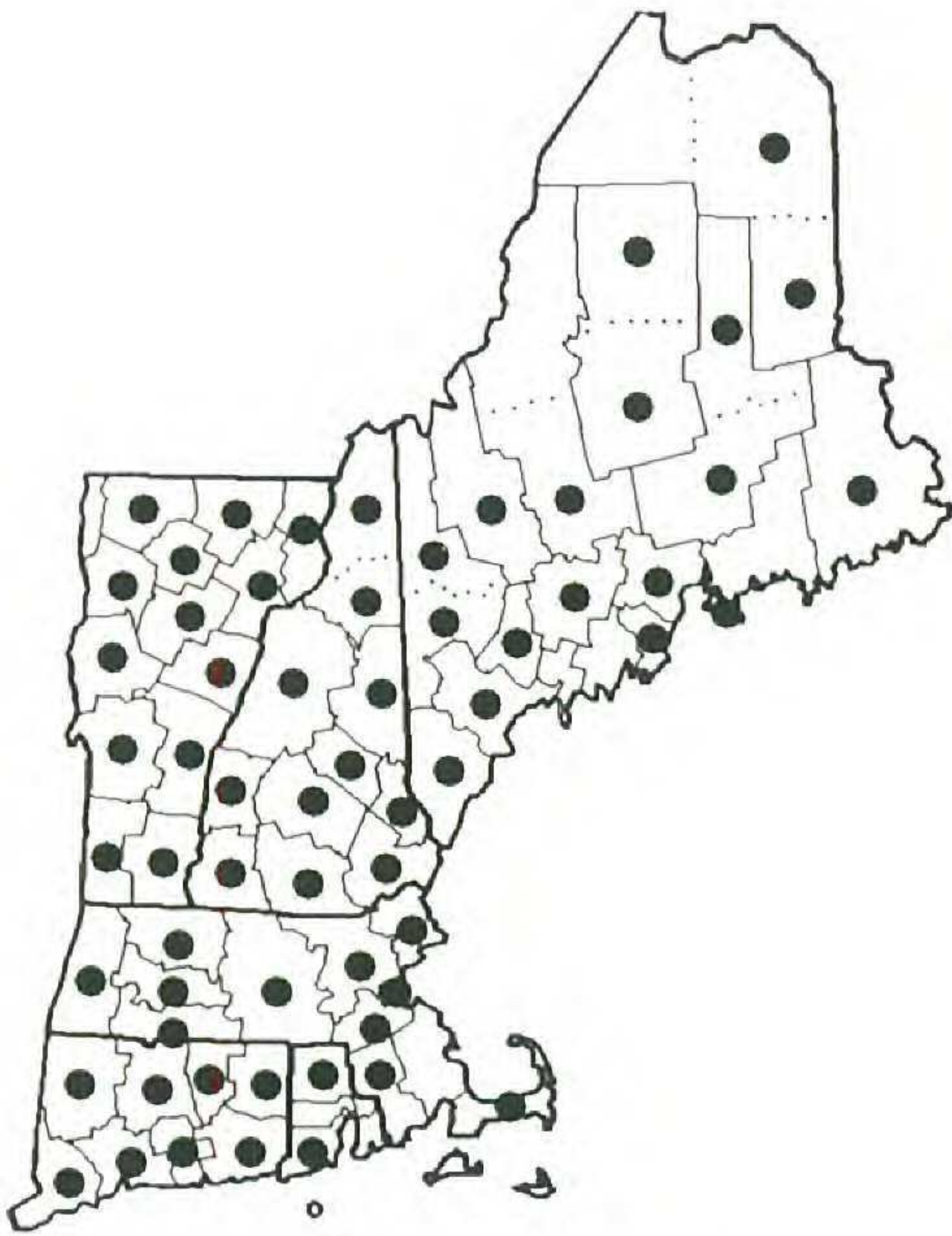


Cystopteris tenuis

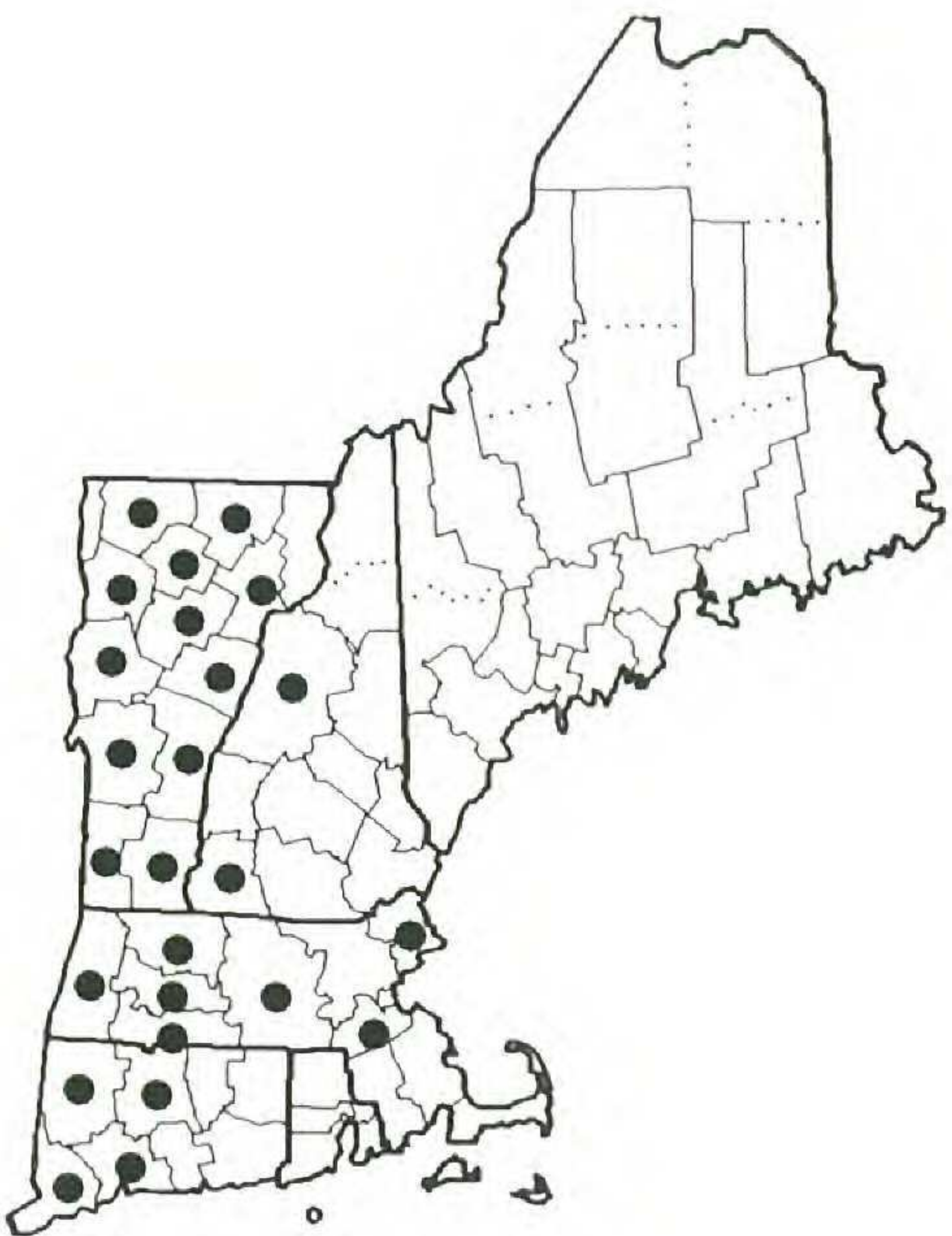


Cystopteris fragilis
 $\times$ *C. tenuis*

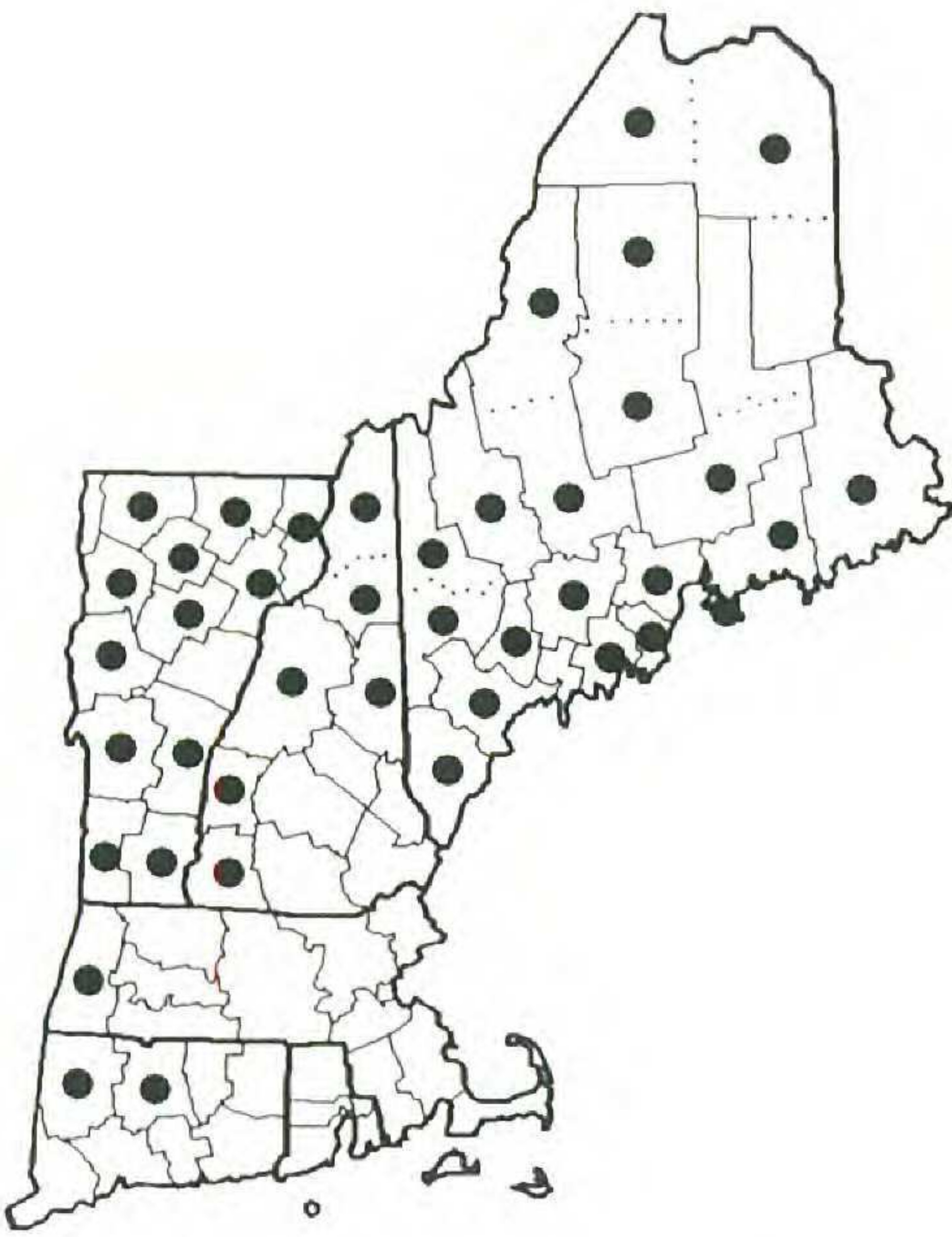
Figure 19. Distribution maps for *Cystopteris fragilis*, *C. protrusa*, *C. tenuis*, and *C. fragilis* $\times$ *C. tenuis*.



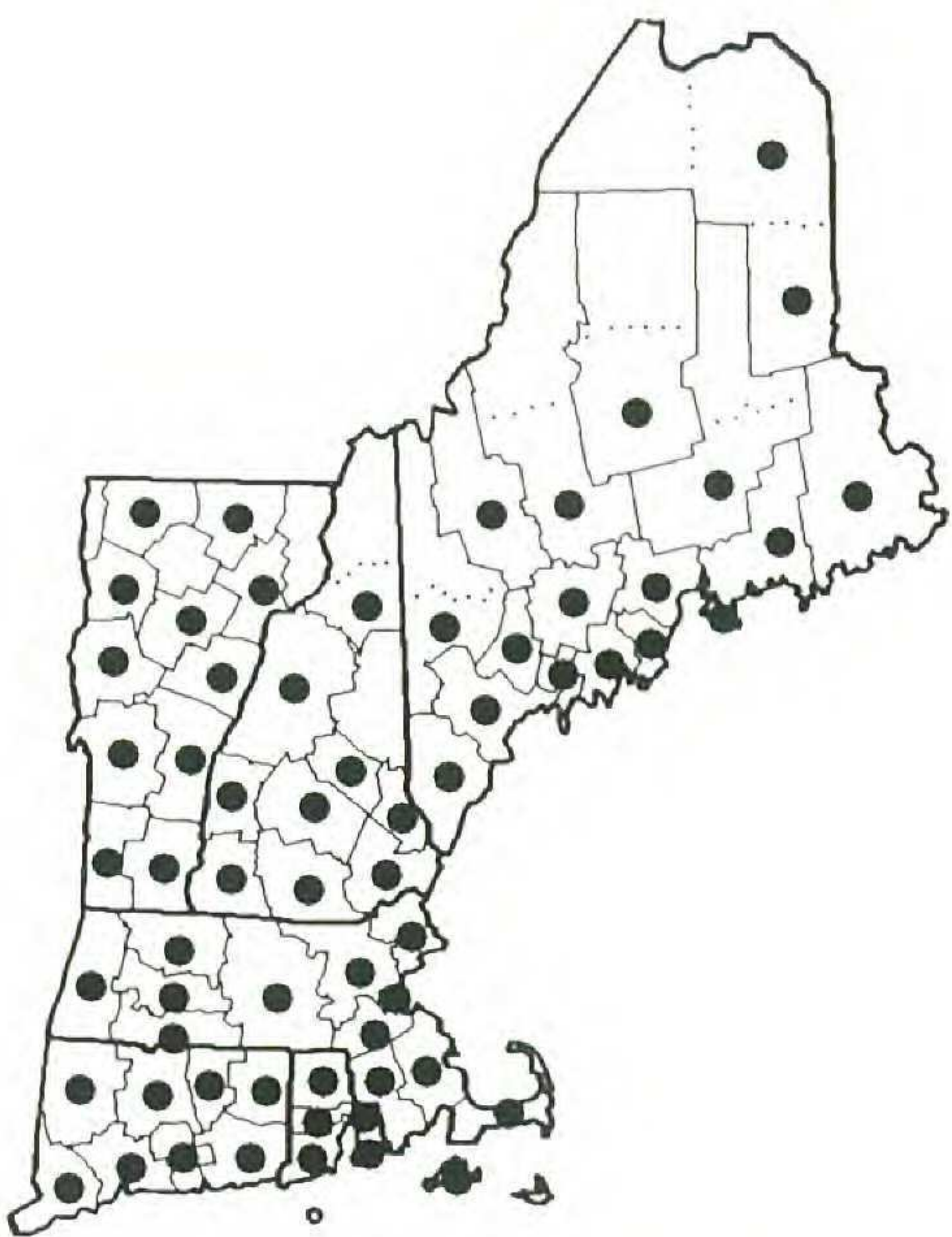
Deparia acrostichoides



Diplazium pycnocarpon

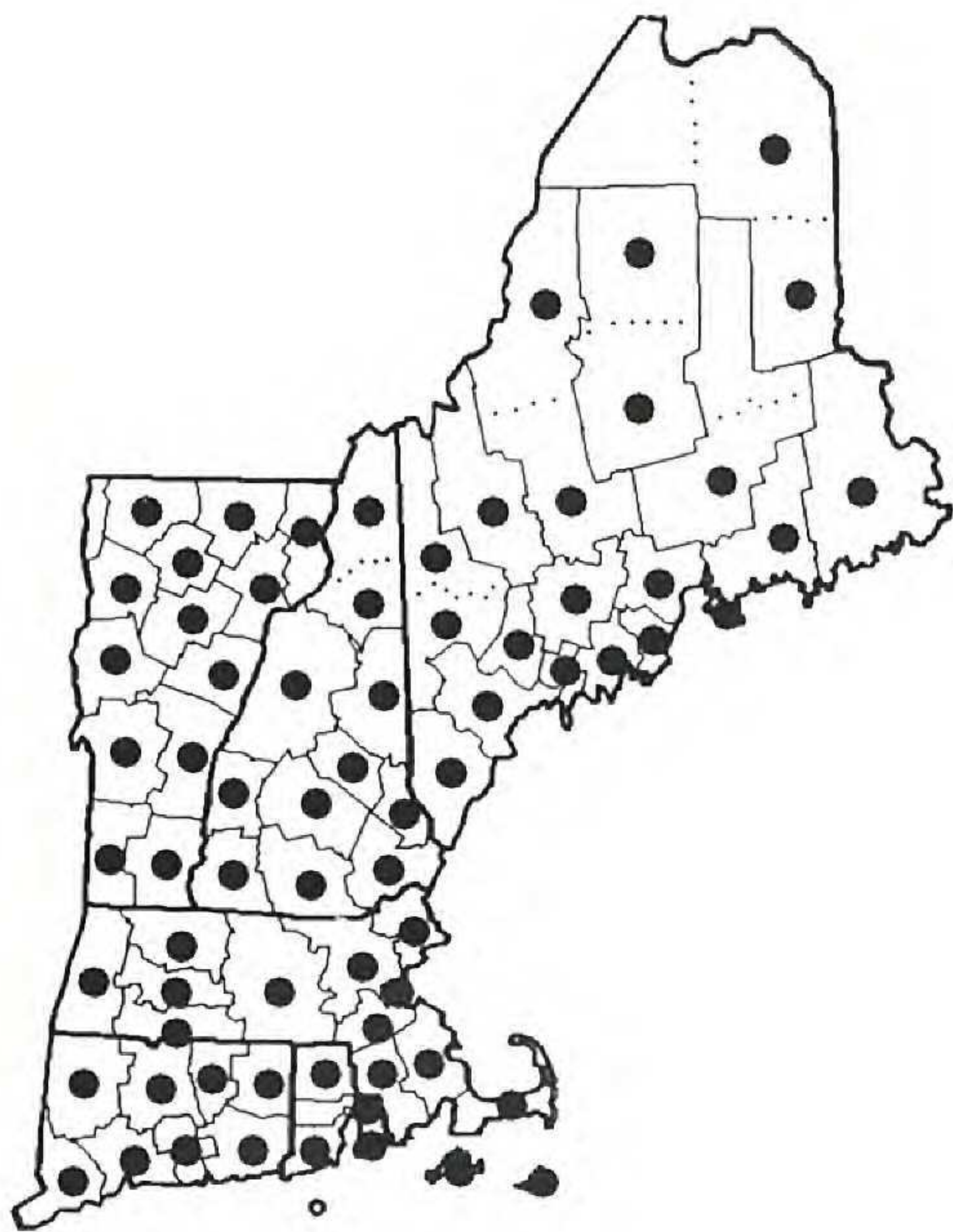


Dryopteris campyloptera

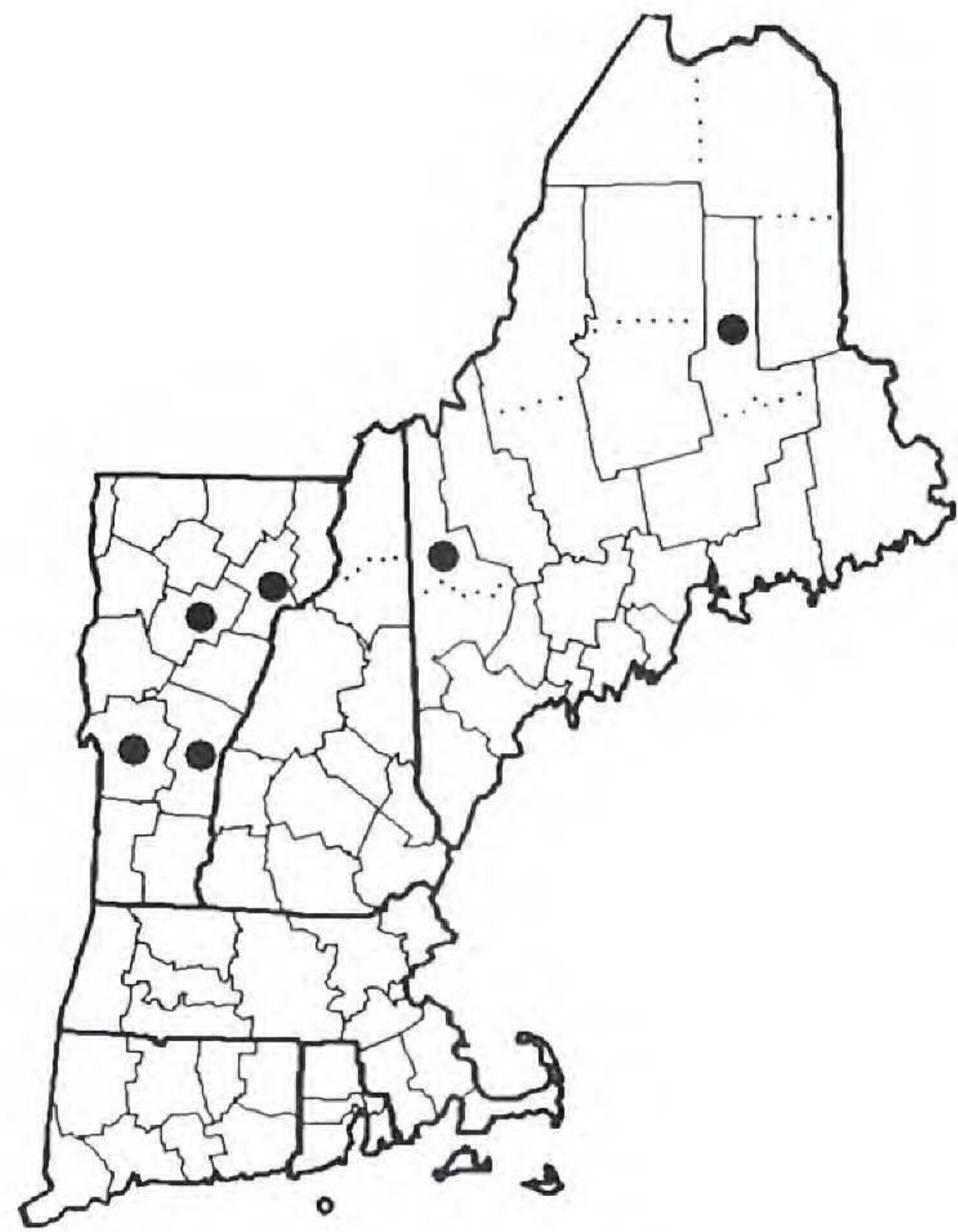


Dryopteris carthusiana

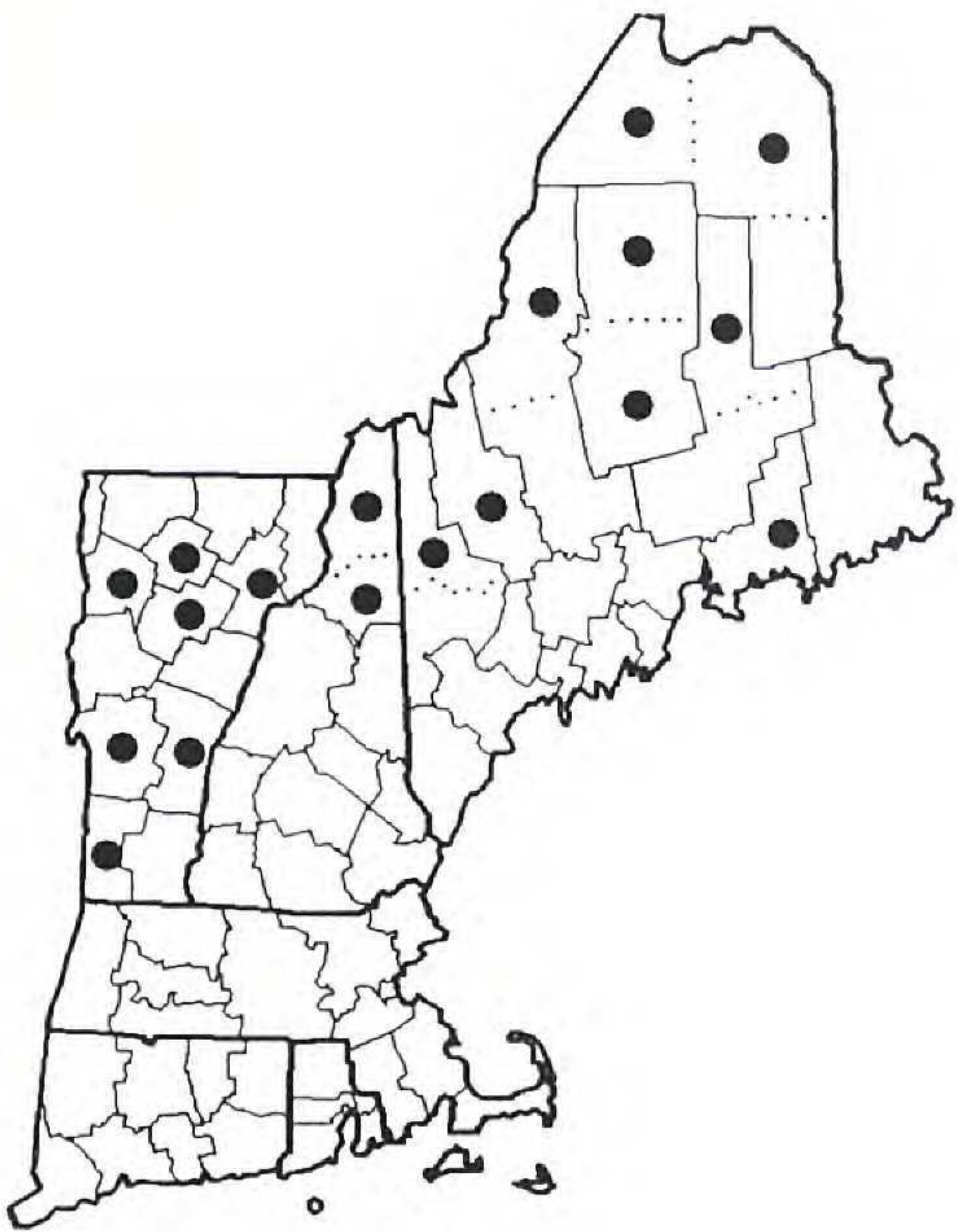
Figure 20. Distribution maps for *Deparia acrostichoides*, *Diplazium pycnocarpon*, *Dryopteris campyloptera*, and *D. carthusiana*.



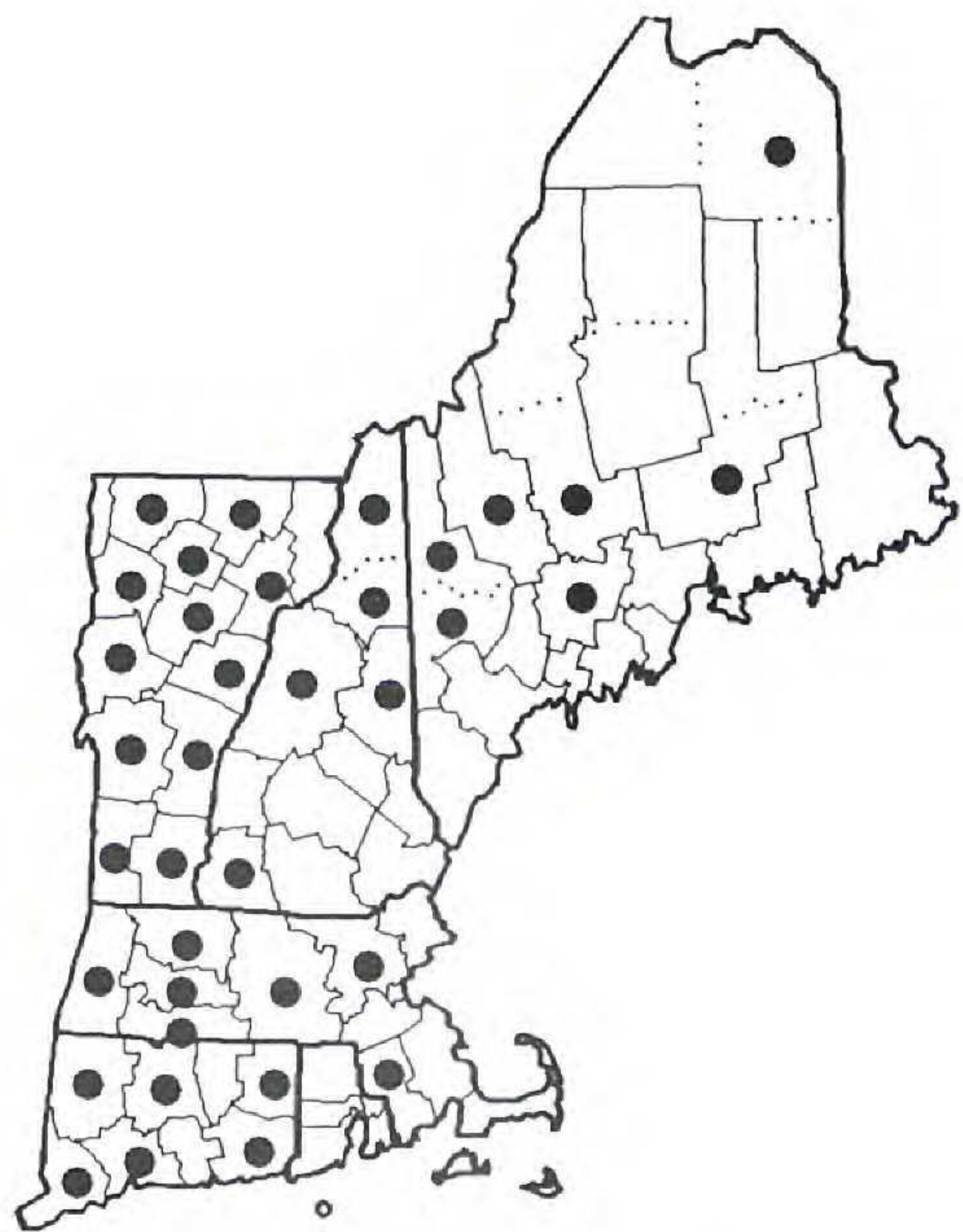
Dryopteris cristata



Dryopteris filix-mas



Dryopteris fragrans



Dryopteris goldiana

Figure 21. Distribution maps for *Dryopteris cristata*, *D. filix-mas*, *D. fragrans*, and *D. goldiana*.

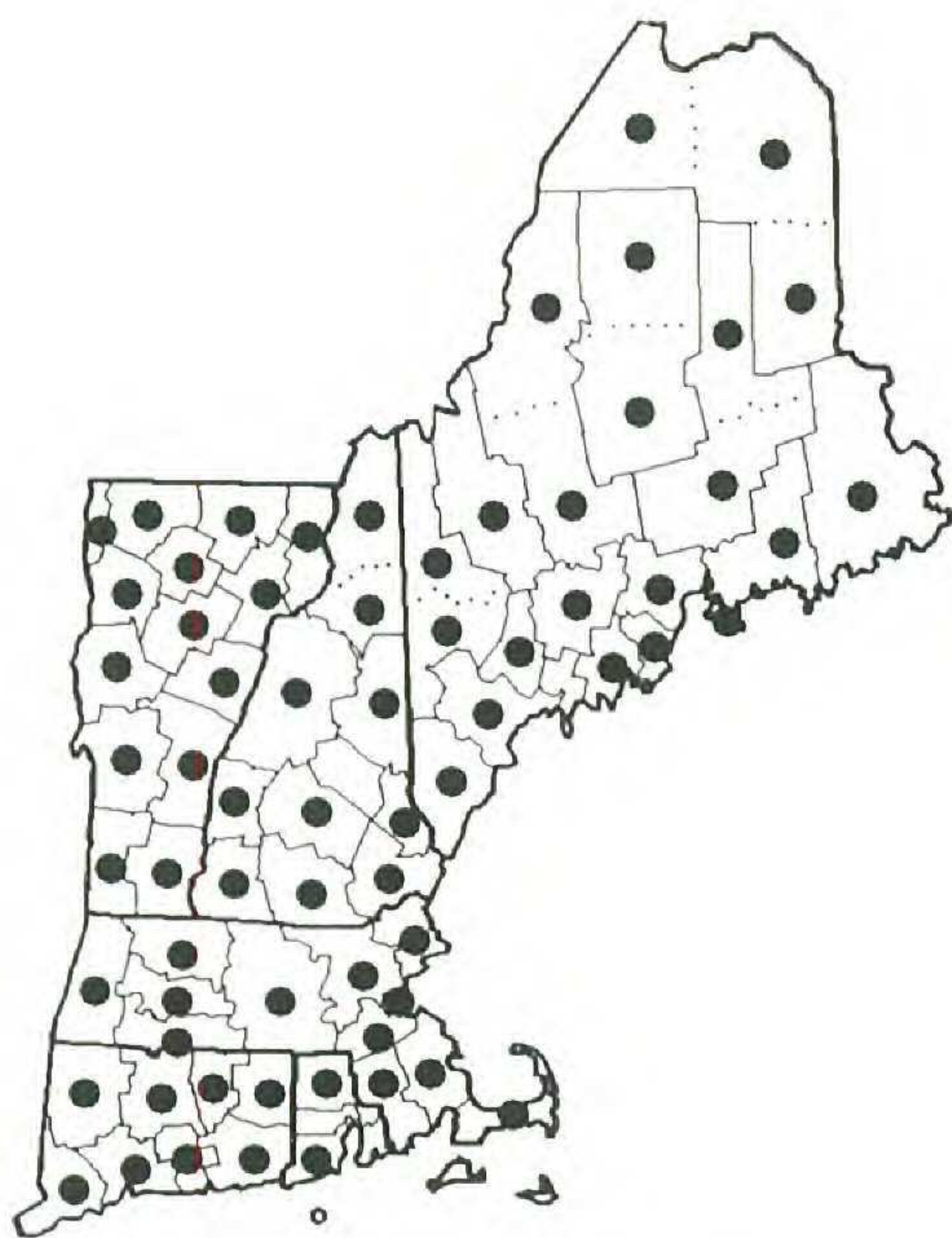
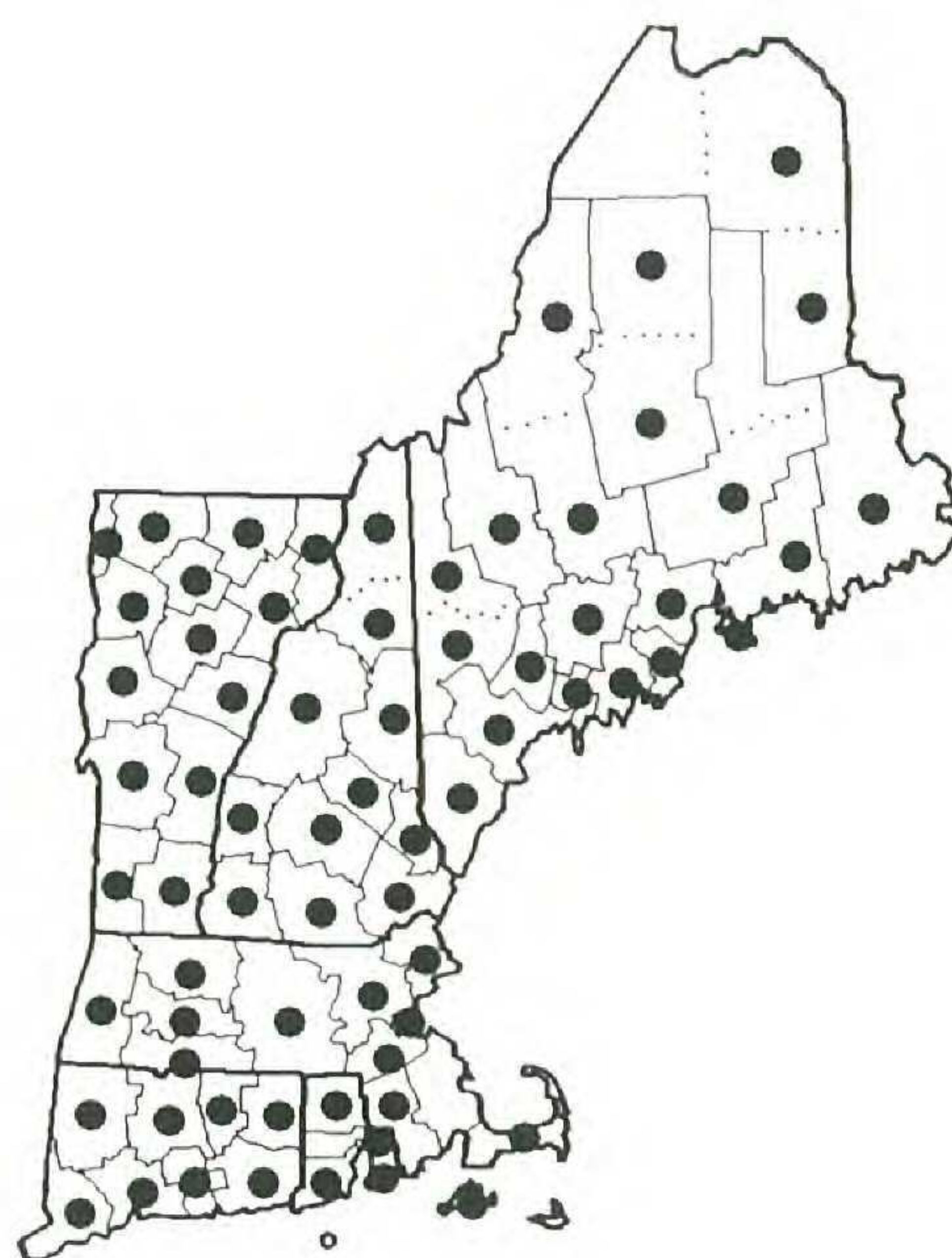
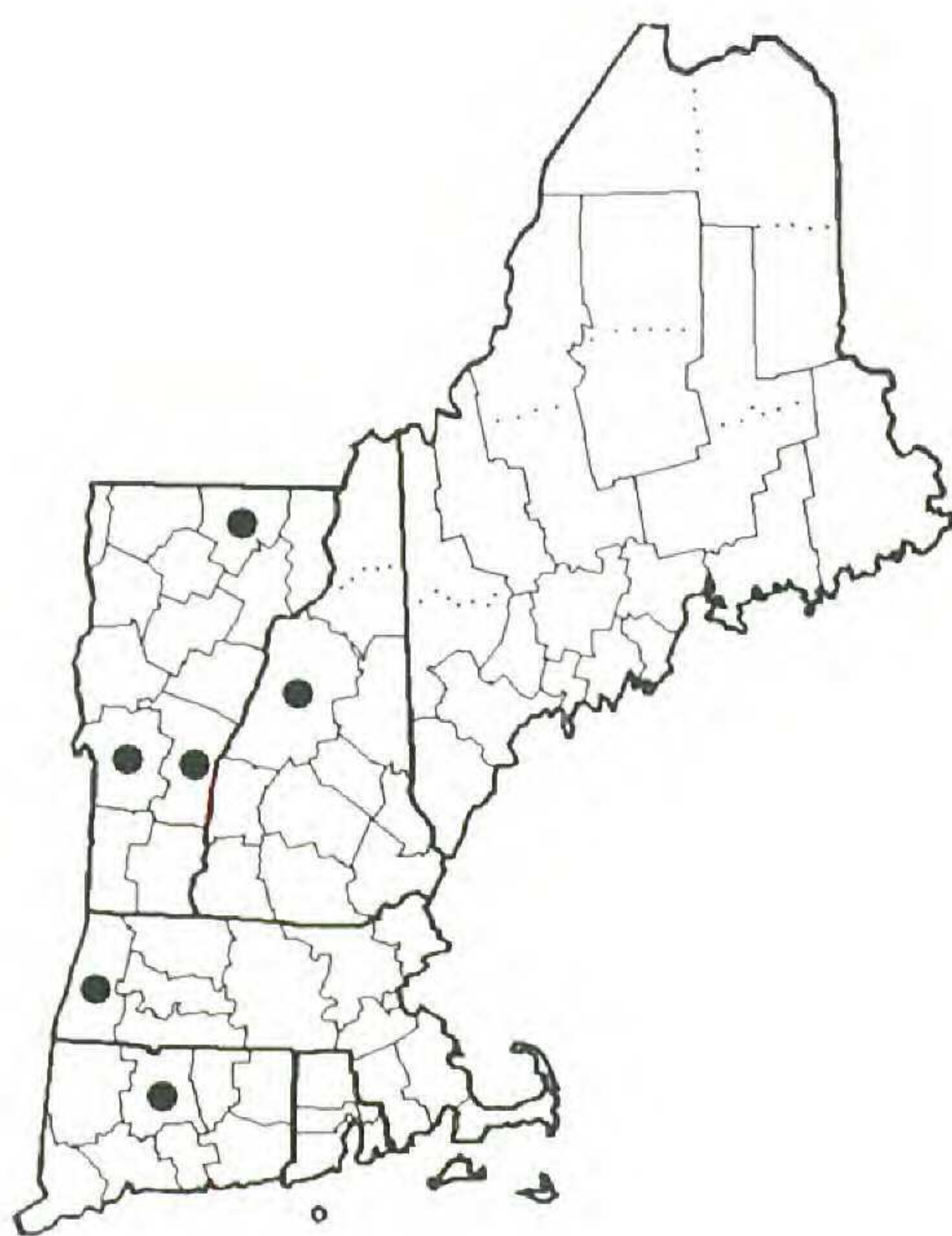
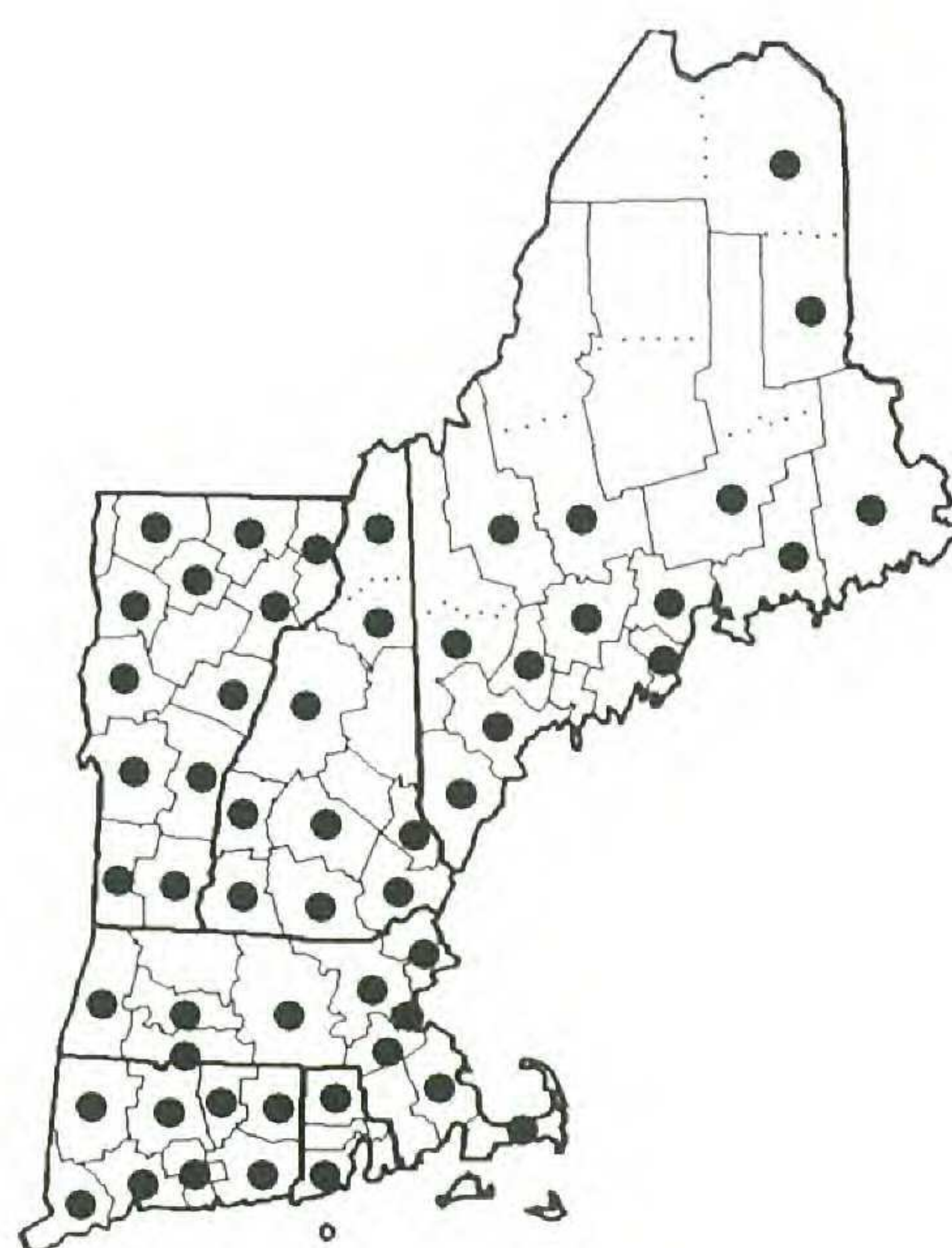
*Dryopteris intermedia**Dryopteris marginalis**Dryopteris x benedictii**Dryopteris x boottii*

Figure 22. Distribution maps for *Dryopteris intermedia*, *D. marginalis*, *D. x benedictii*, and *D. x boottii*.



Dryopteris × *burgessii*



Dryopteris campyloptera
× *D. intermedia*

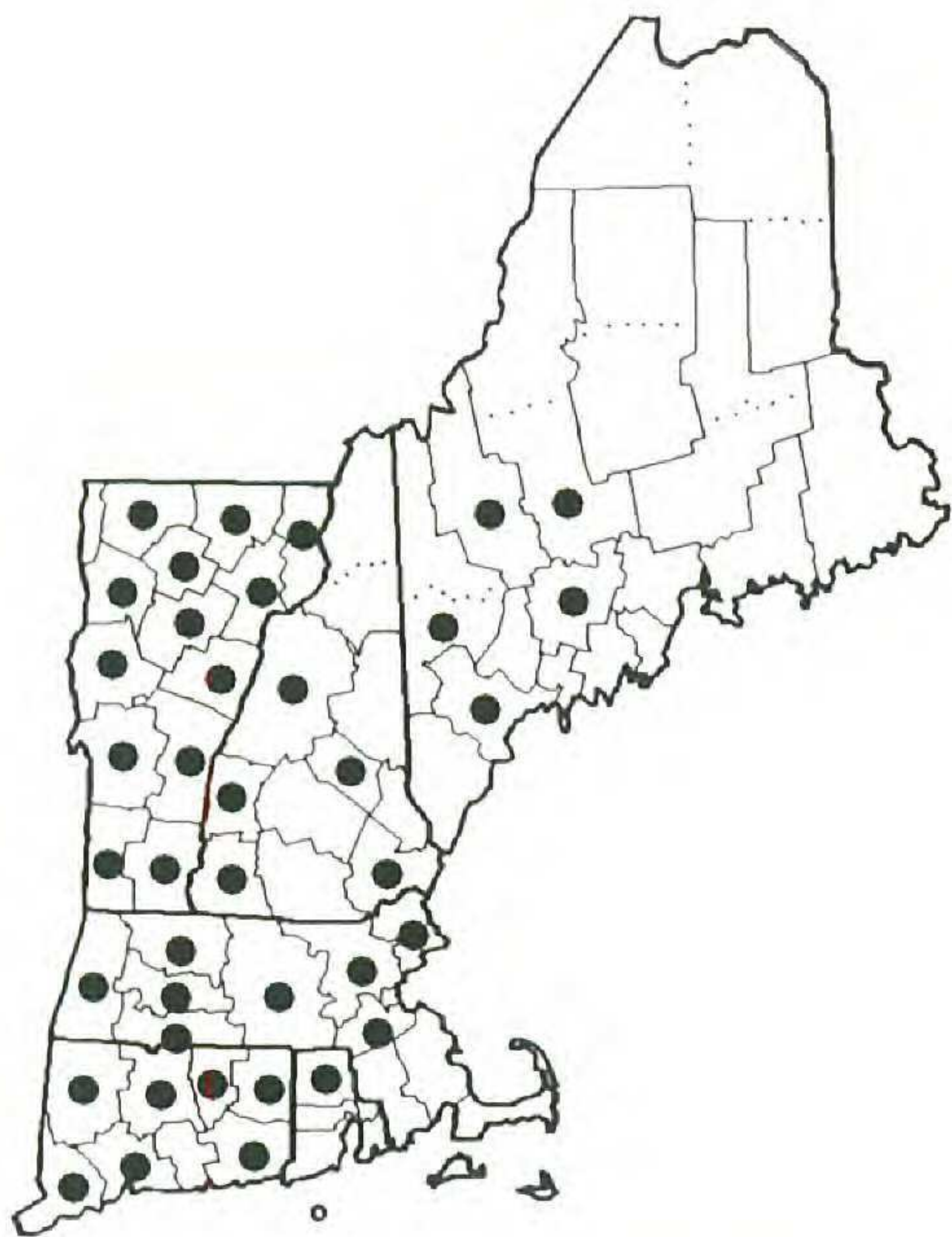


Dryopteris campyloptera
× *D. marginalis*

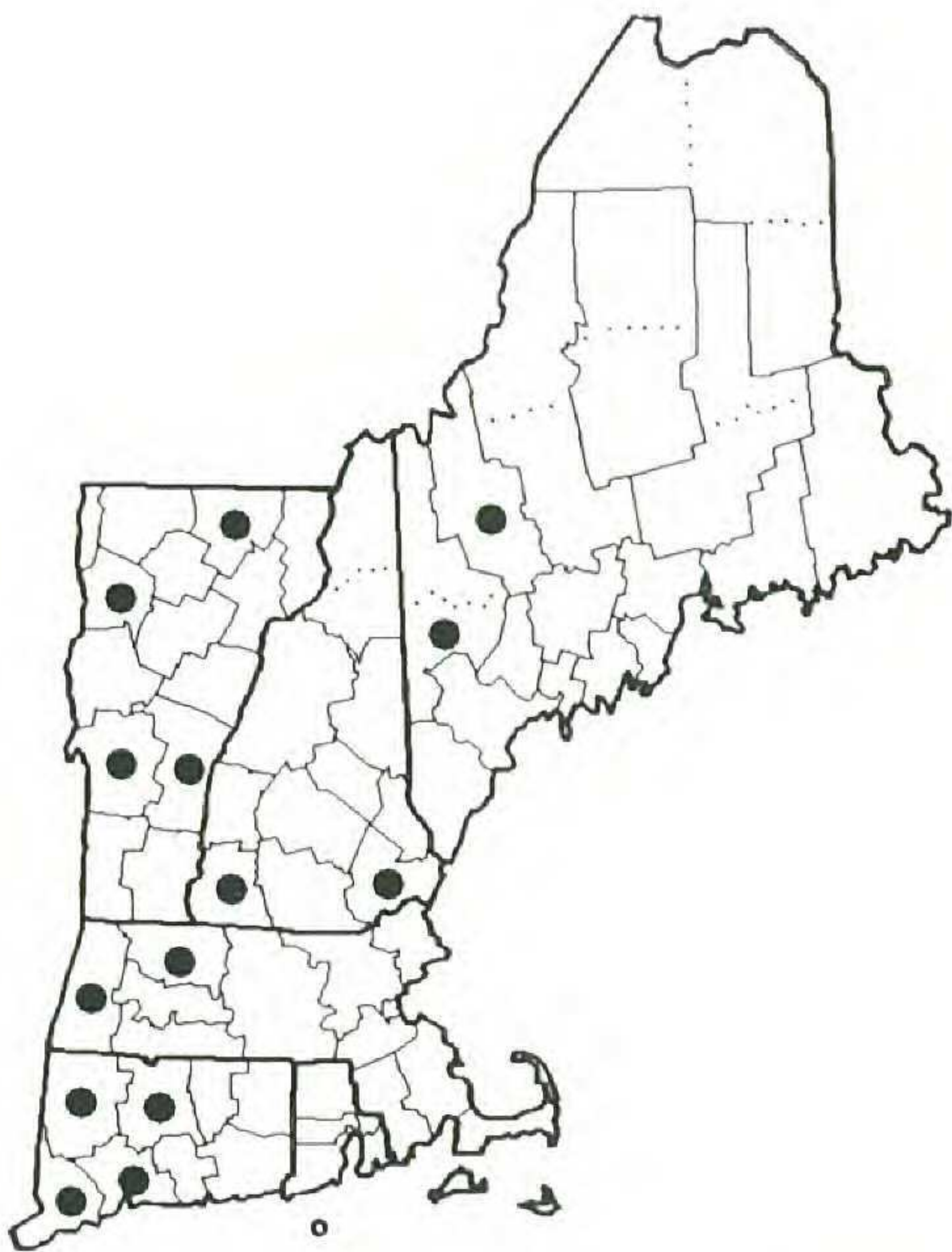


Dryopteris carthusiana
× *D. goldiana*

Figure 23. Distribution maps for *Dryopteris* × *burgessii*, *D. campyloptera* × *D. intermedia*, *D. campyloptera* × *D. marginalis*, and *D. carthusiana* × *D. goldiana*.



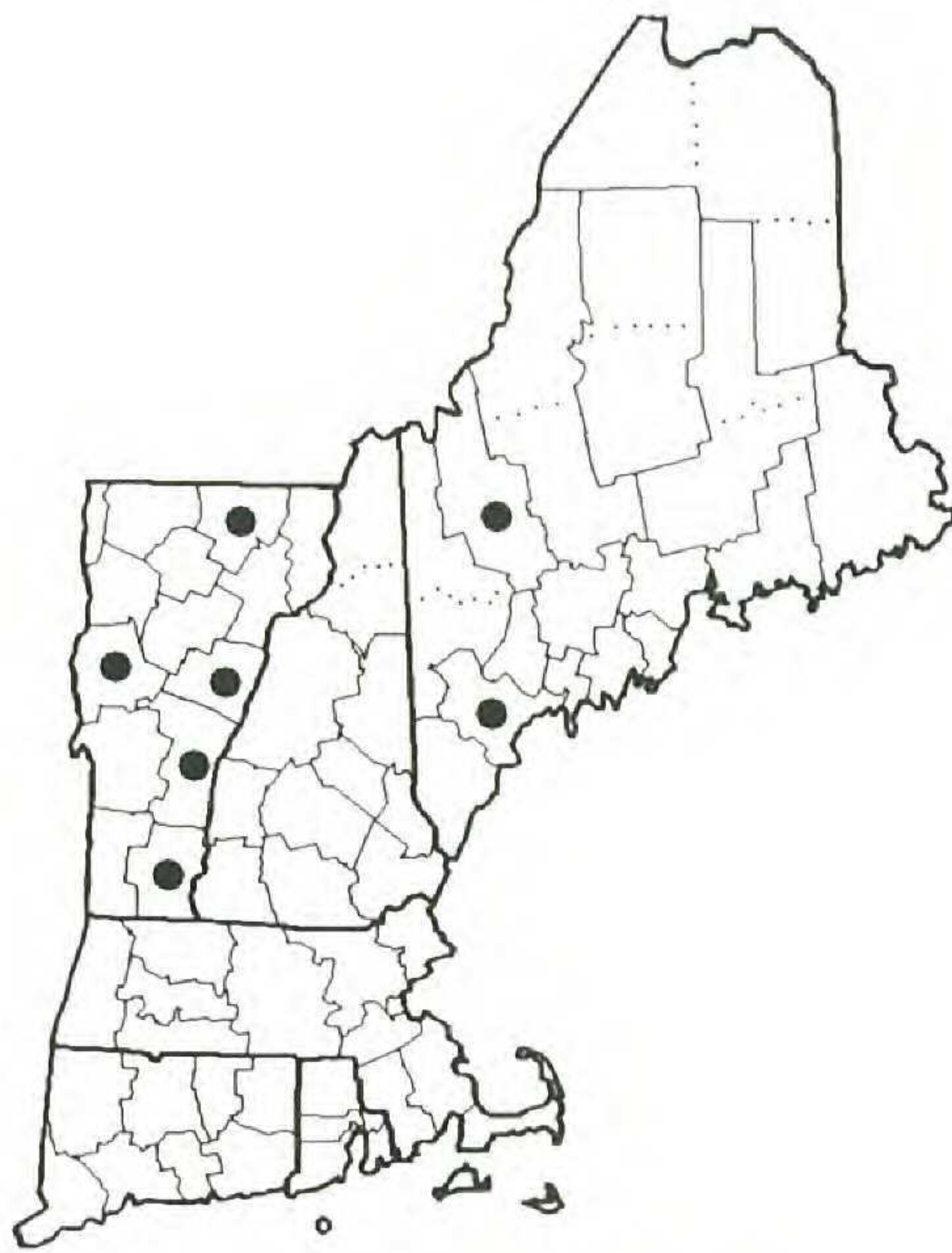
Dryopteris x *clintoniana*



Dryopteris x *clintoniana* x *D. cristata*

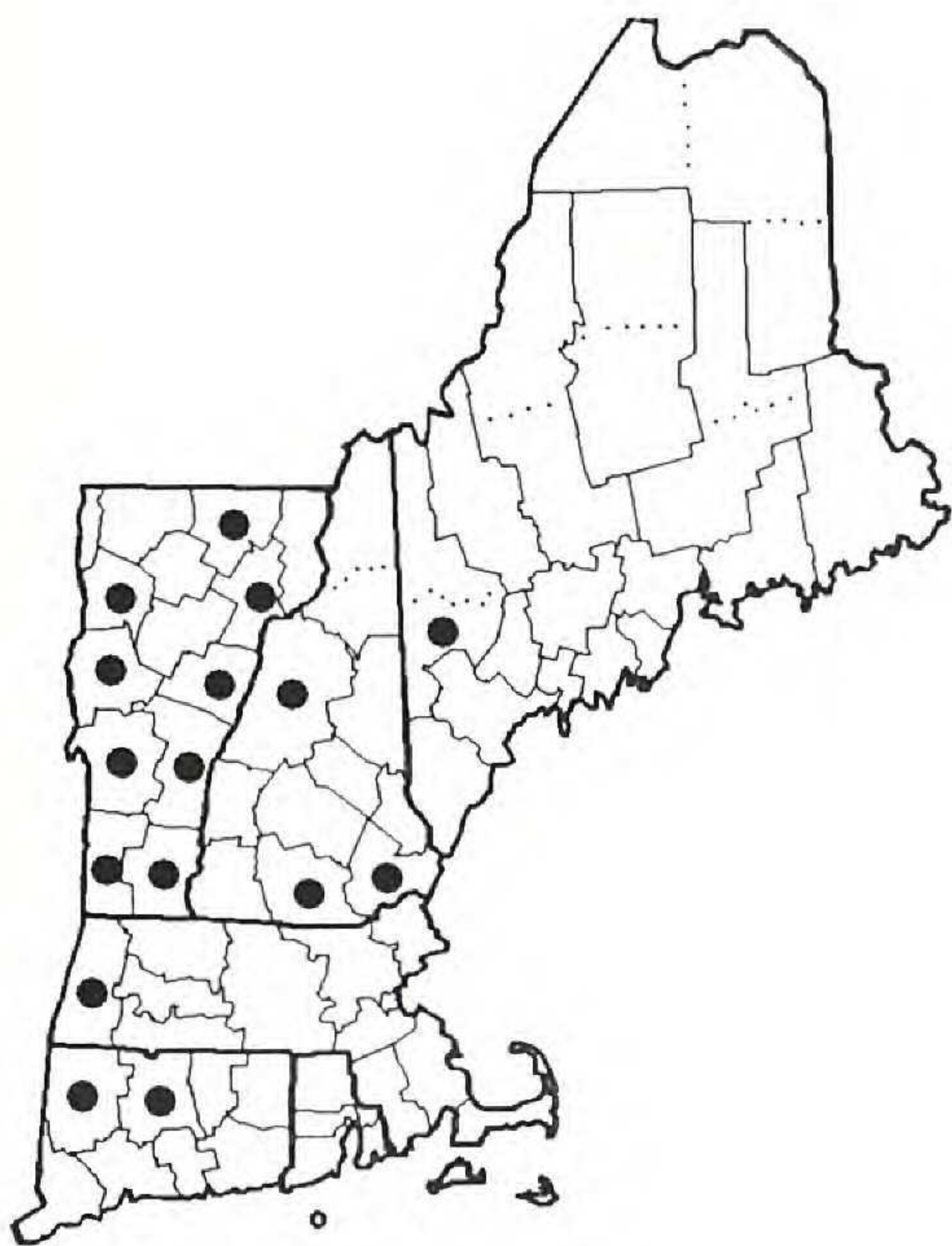


Dryopteris x *clintoniana*
x *D. filix-mas*



Dryopteris x *clintoniana*
x *D. goldiana*

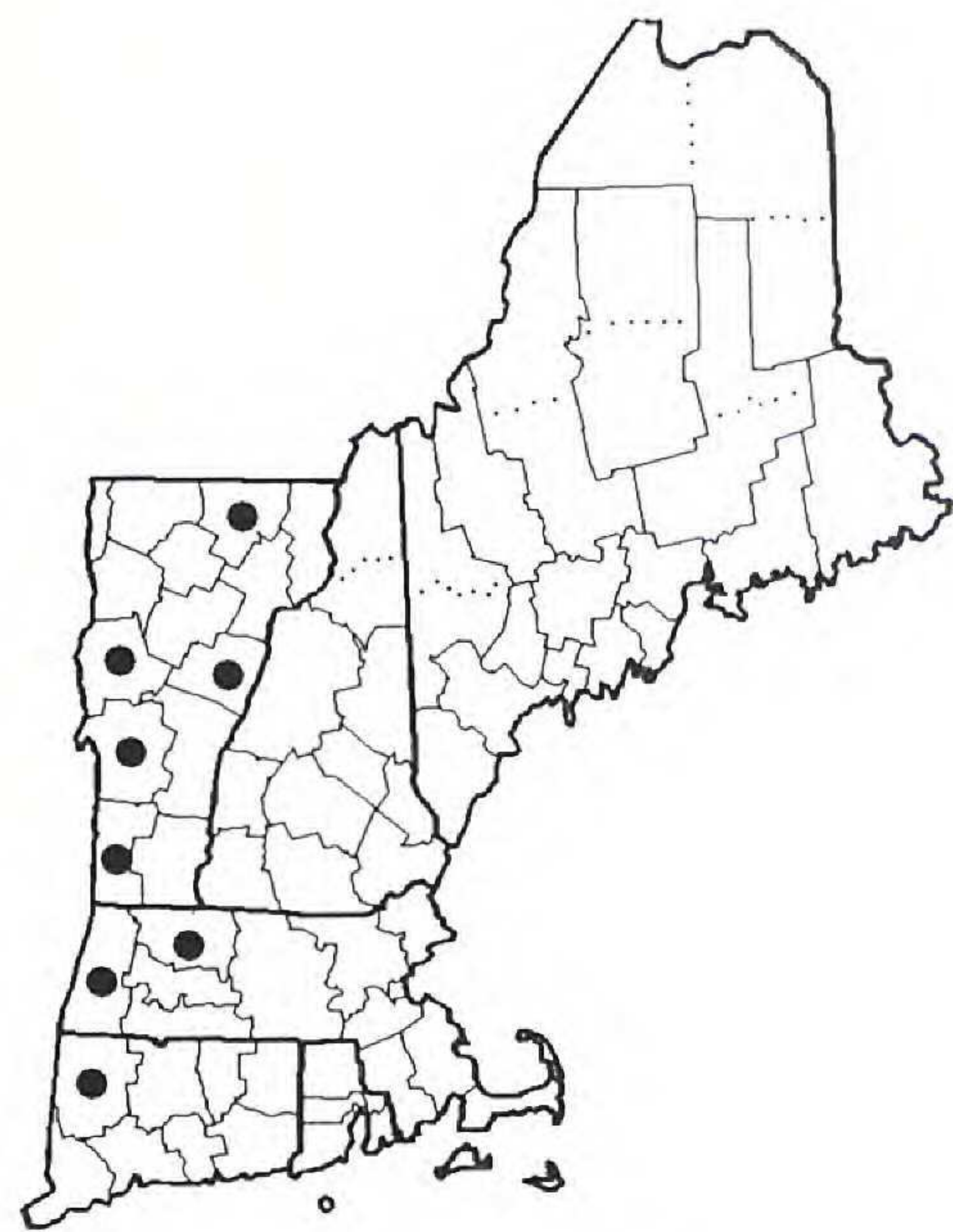
Figure 24. Distribution maps for *Dryopteris* x *clintoniana*, *D.* x *clintoniana* x *D. cristata*, *D.* x *clintoniana* x *D. filix-mas*, and *D.* x *clintoniana* x *D. goldiana*.



Dryopteris x *dowellii*



Dryopteris filix-mas
x *D. marginalis*

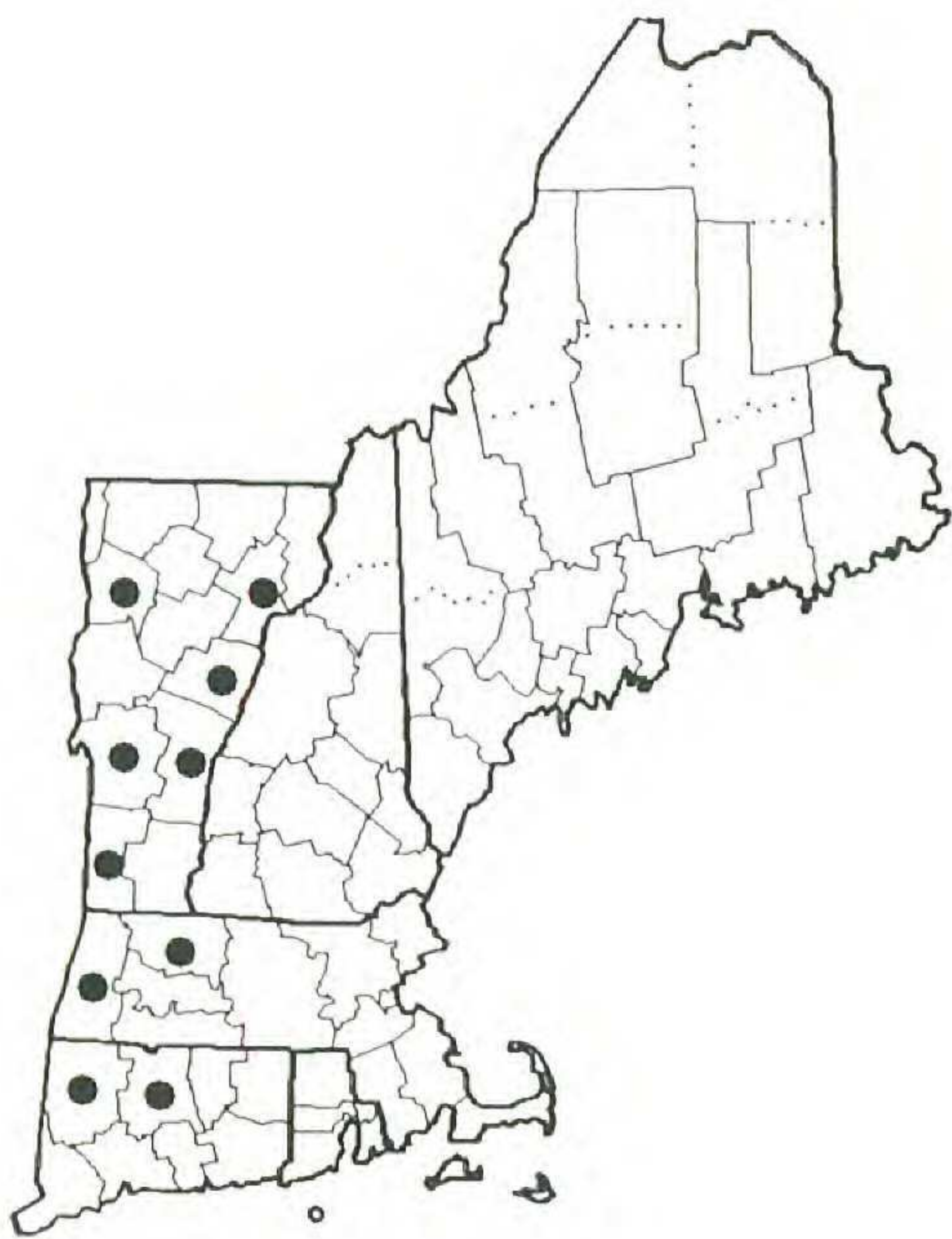


Dryopteris goldiana x *D. intermedia*

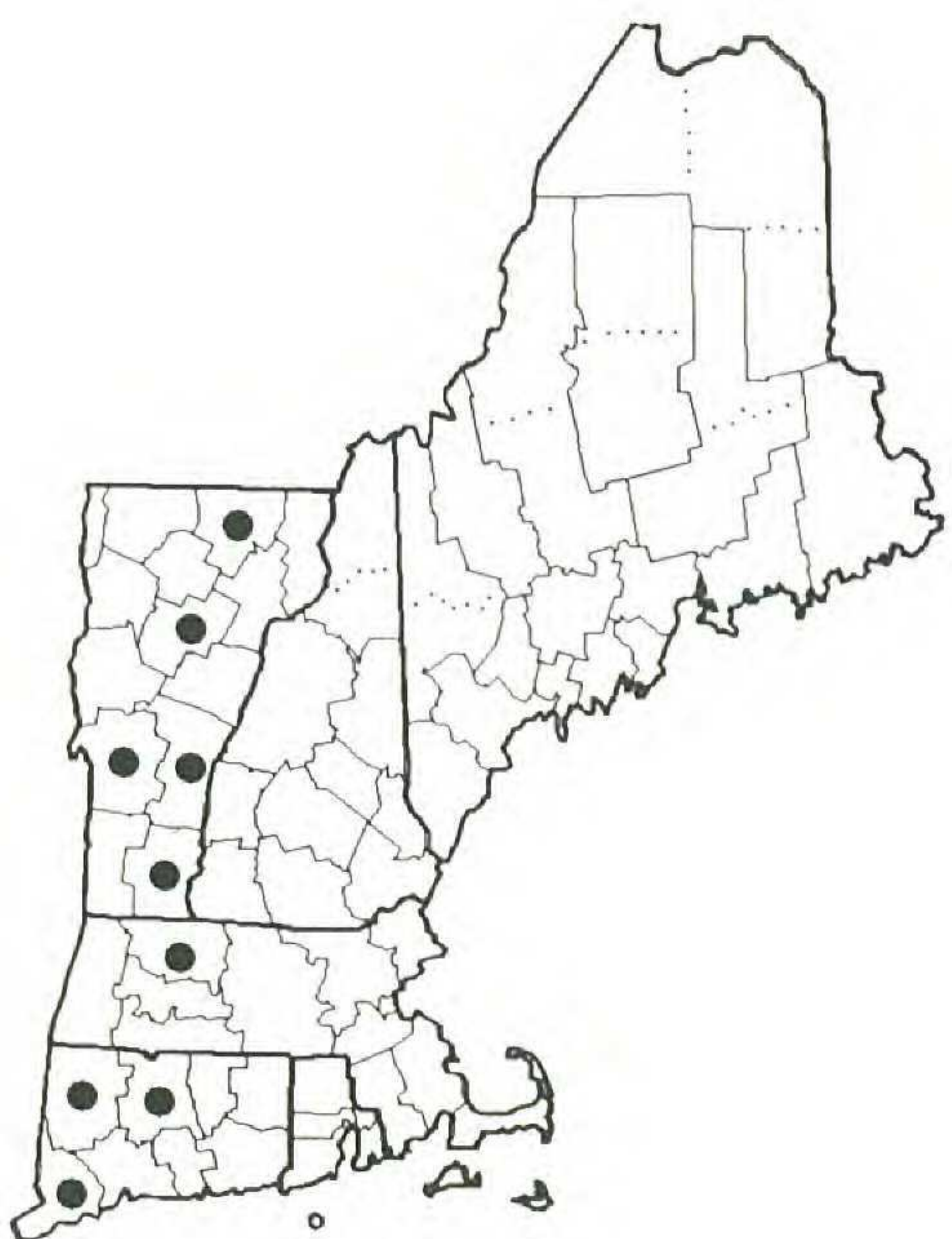


Dryopteris intermedia x *D. marginalis*

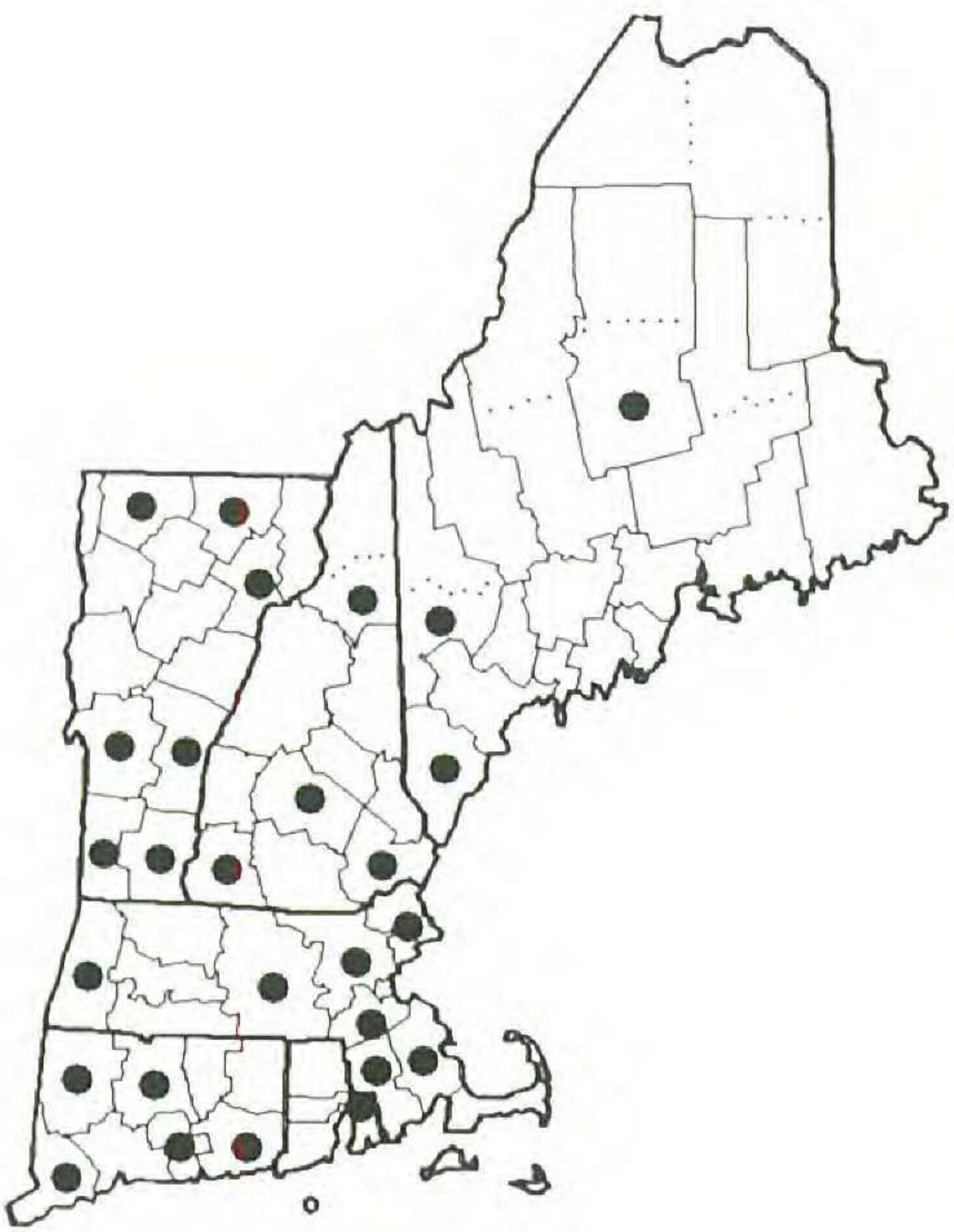
Figure 25. Distribution maps for *Dryopteris* x *dowellii*, *D. filix-mas* x *D. marginalis*, *D. goldiana* x *D. intermedia*, and *D. intermedia* x *D. marginalis*.



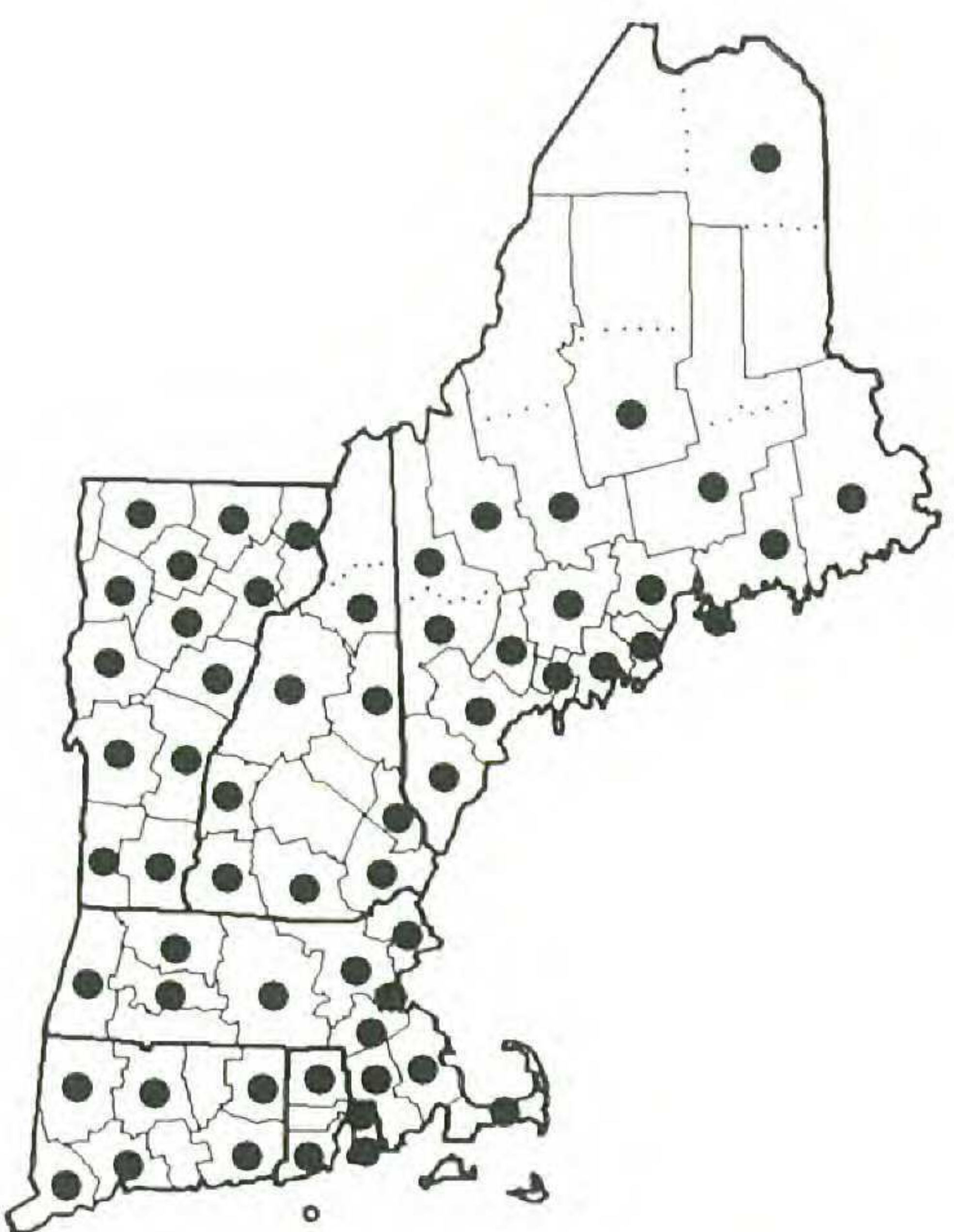
Dryopteris x *neowherryi*



Dryopteris x *pittsfordensis*

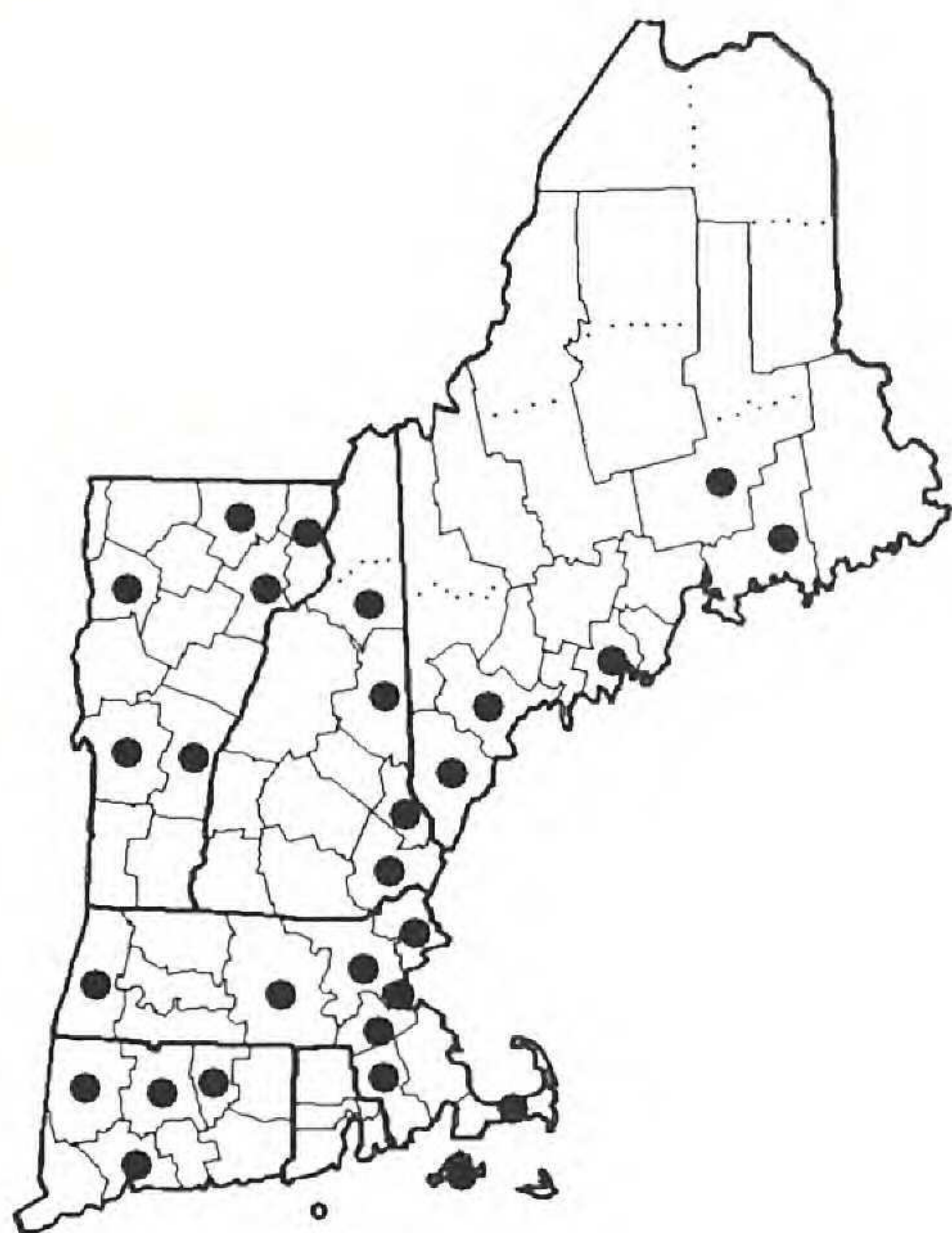


Dryopteris x *slossoniae*

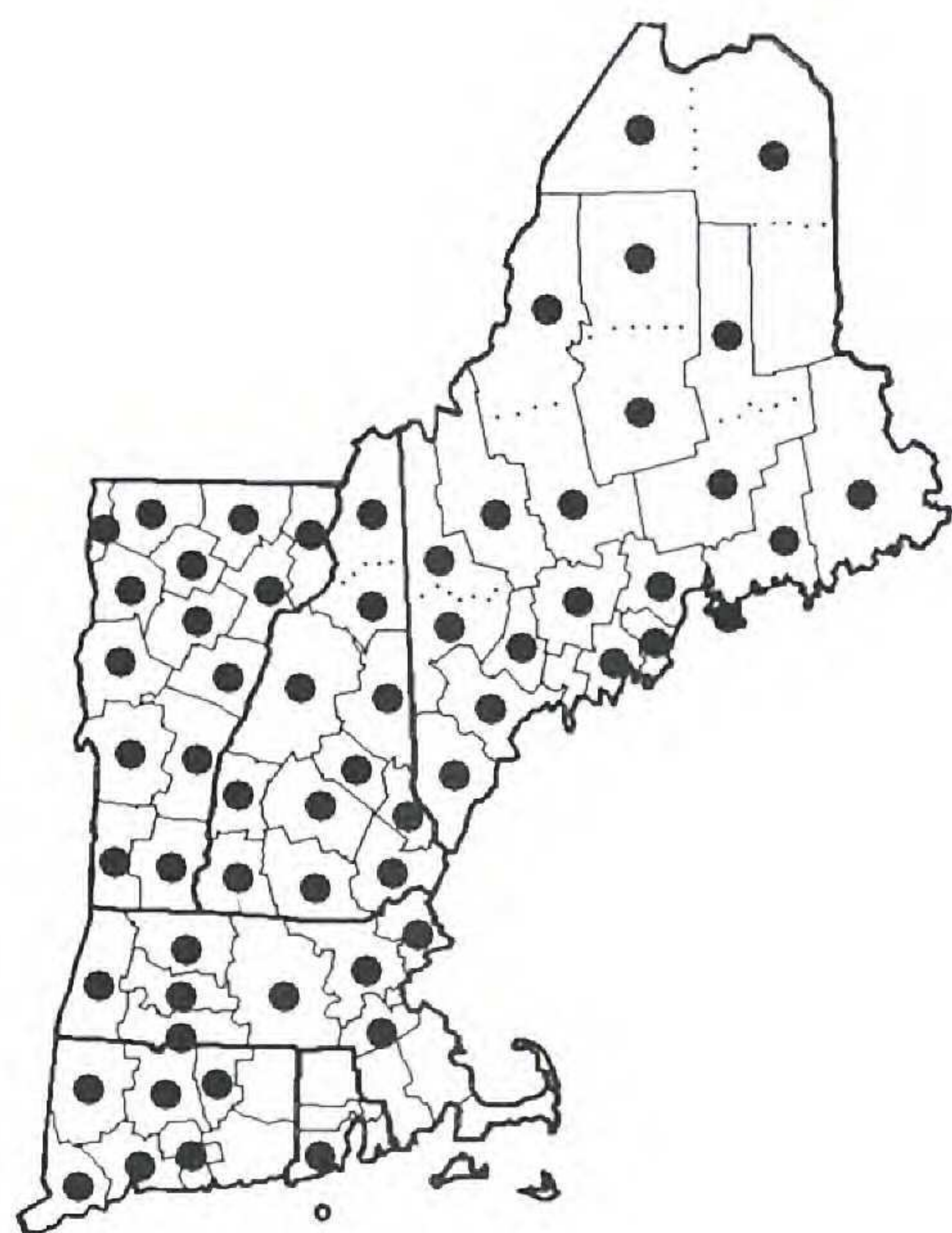


Dryopteris x *triploidea*

Figure 26. Distribution maps for *Dryopteris* x *neowherryi*, *D.* x *pittsfordensis*, *D.* x *slossoniae*, and *D.* x *triploidea*.



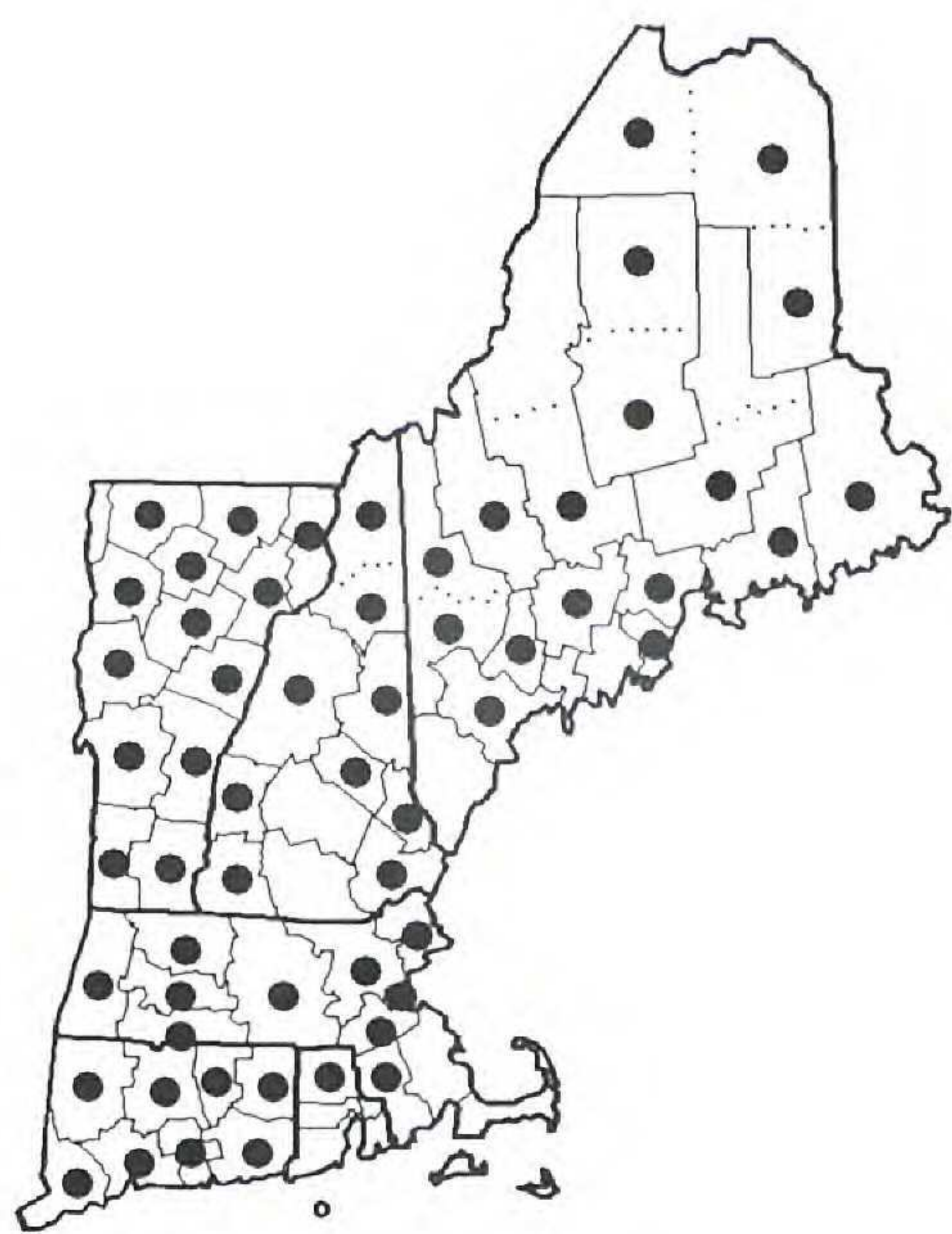
Dryopteris × *uliginosa*



Gymnocarpium dryopteris



Gymnocarpium jessoense
subsp. *parvulum*



Matteuccia struthiopteris

Figure 27. Distribution maps for *Dryopteris* × *uliginosa*, *Gymnocarpium dryopteris*, *G. jessoense* subsp. *parvulum*, and *Matteuccia struthiopteris*.

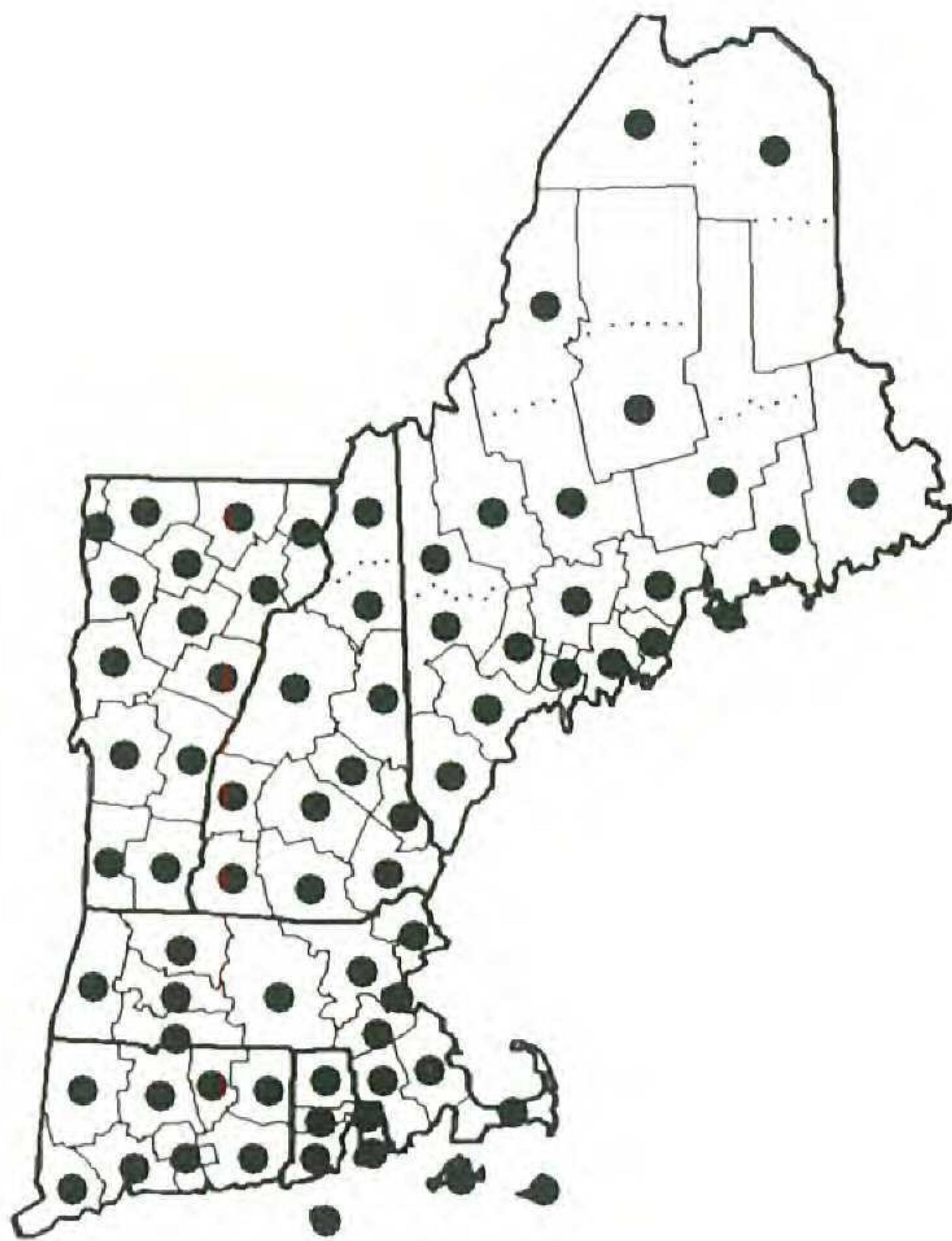
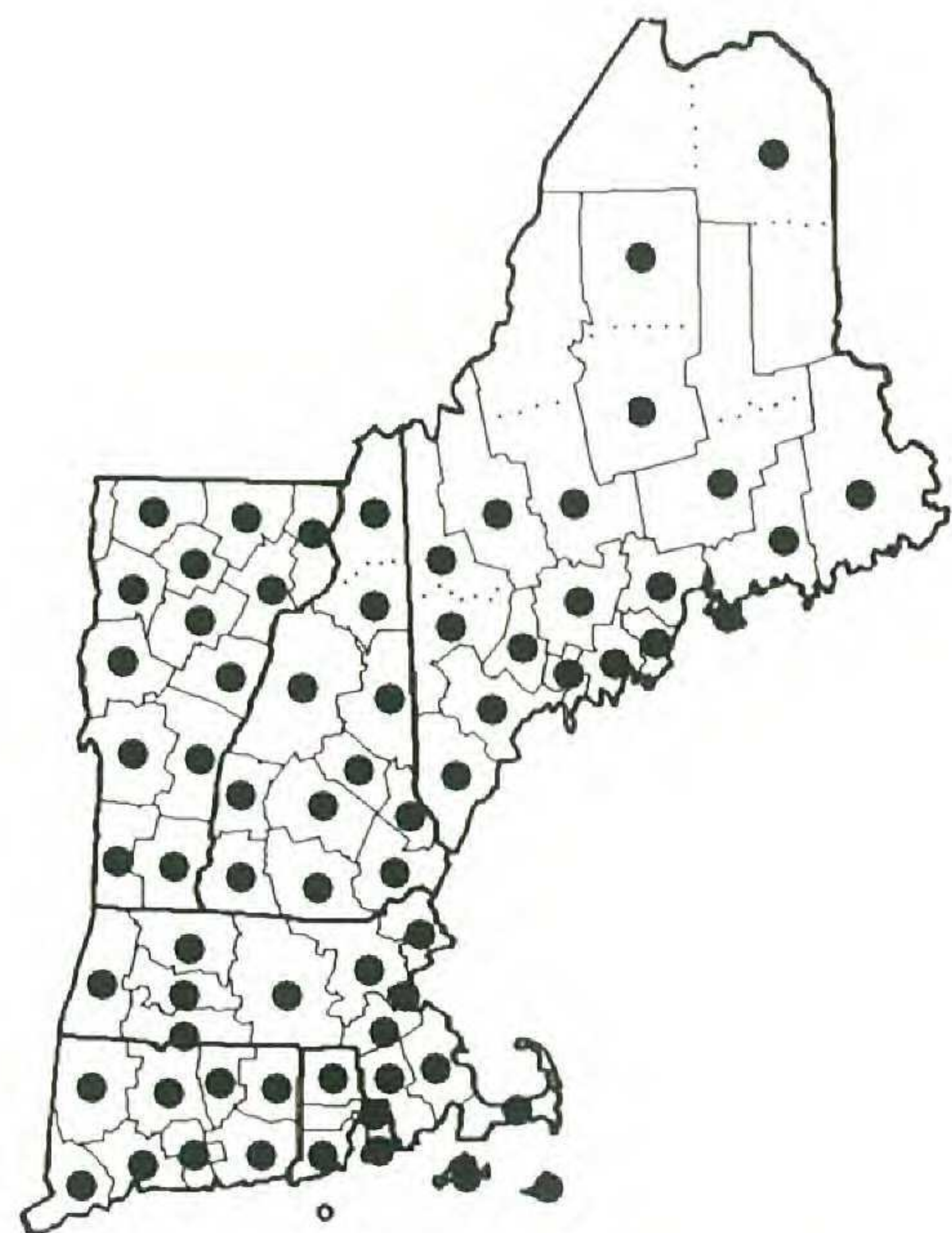
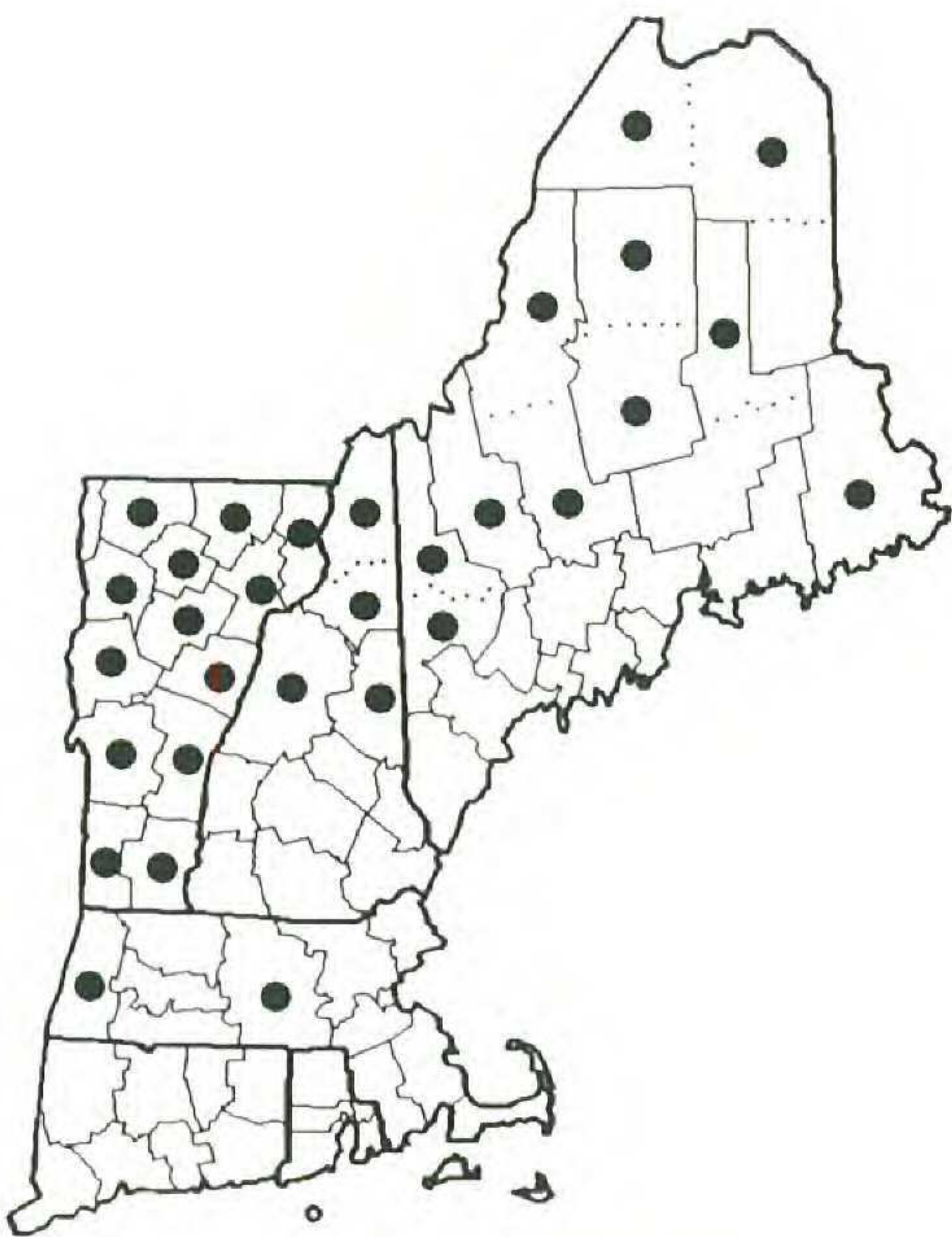
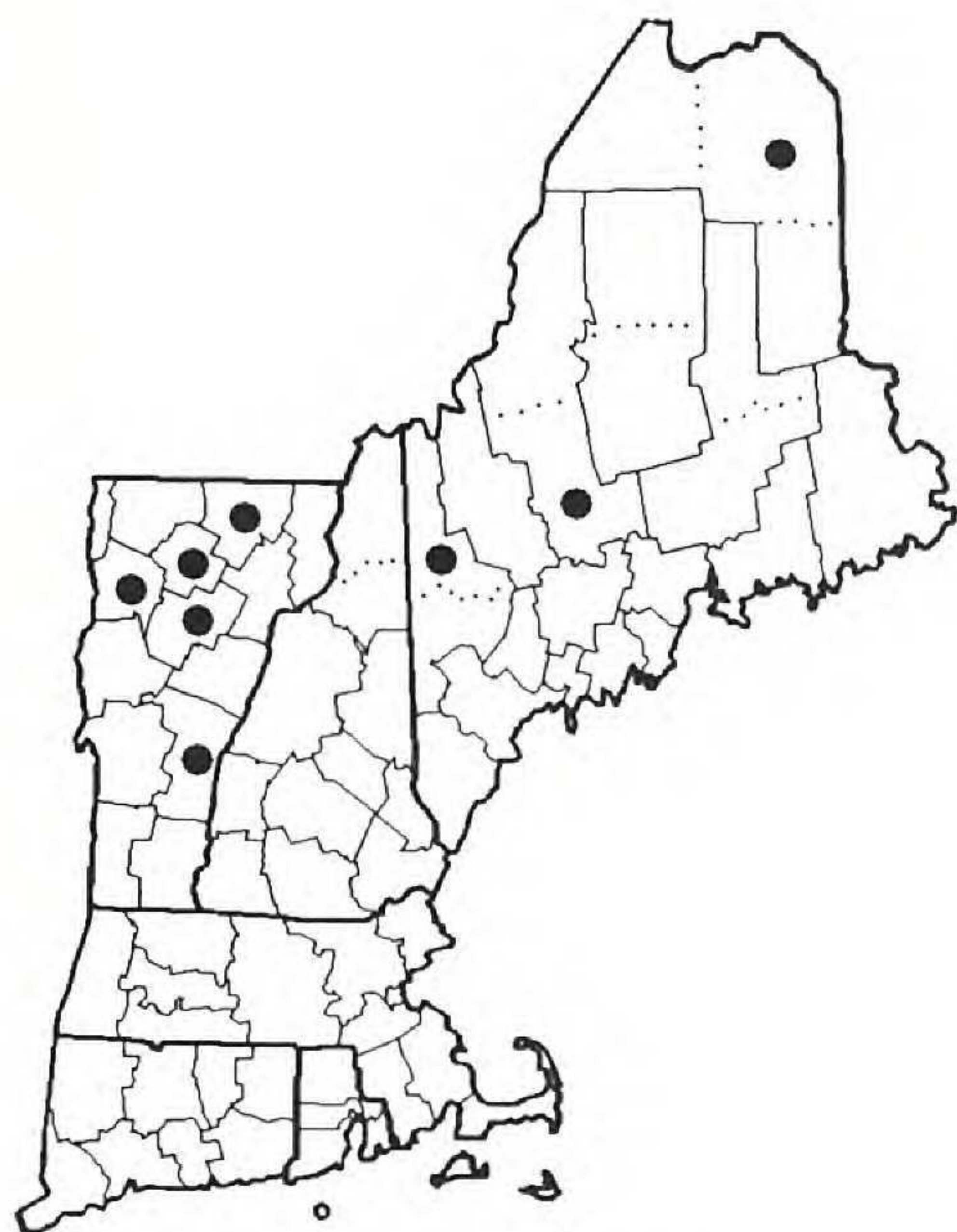
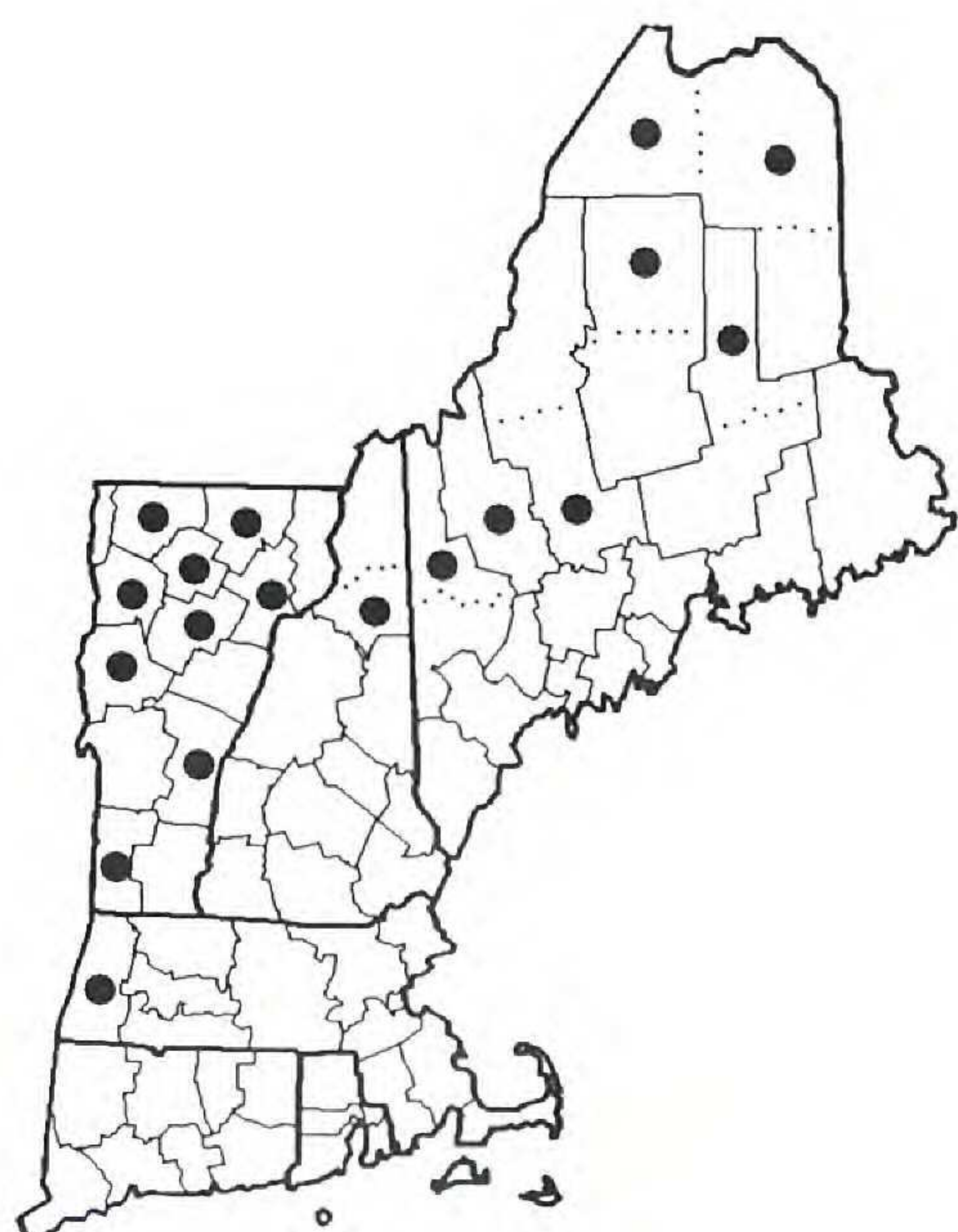
*Onoclea sensibilis**Polystichum acrostichoides**Polystichum braunii**Polystichum x potteri*

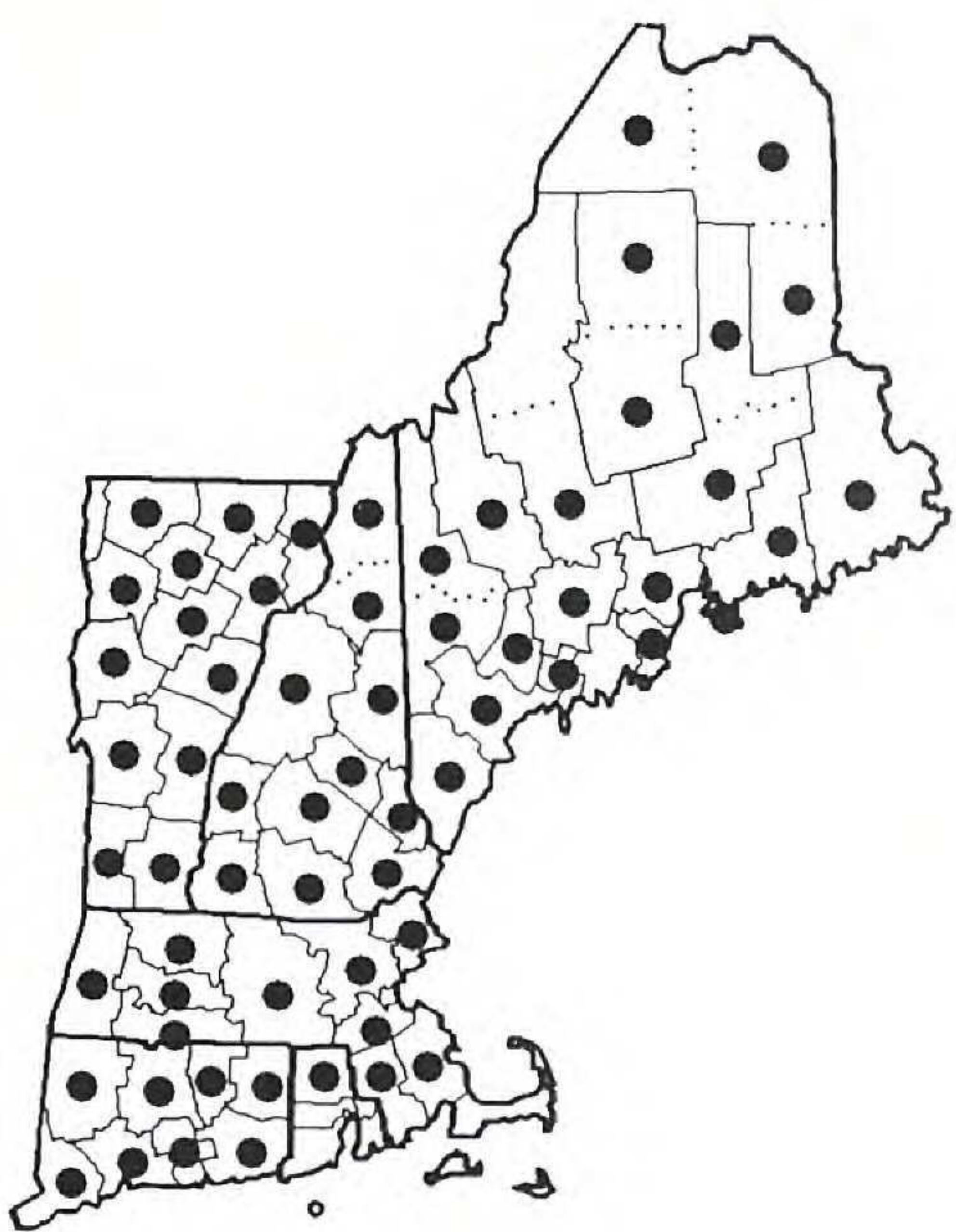
Figure 28. Distribution maps for *Onoclea sensibilis*, *Polystichum acrostichoides*, *P. braunii*, and *P. x potteri*.



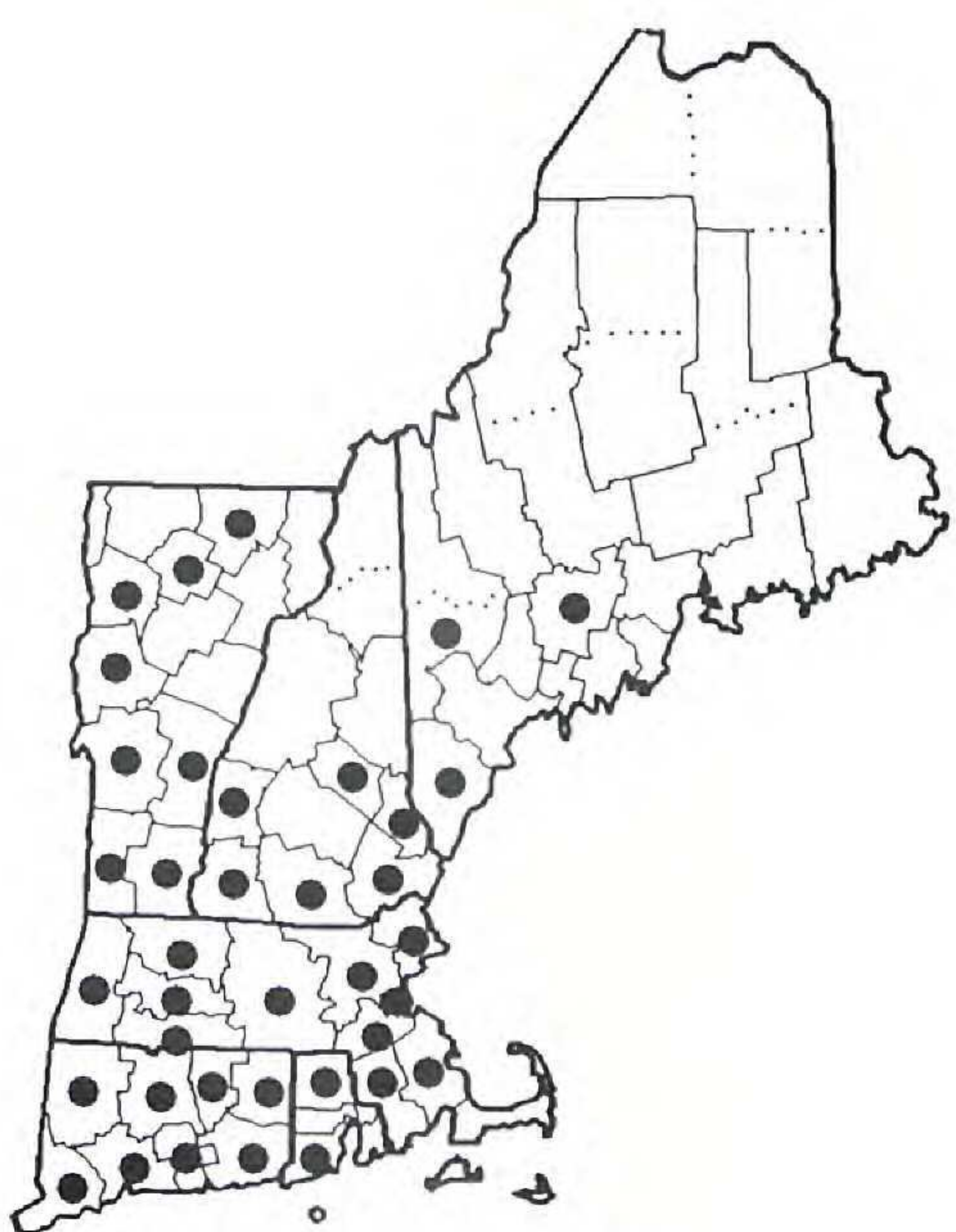
Woodsia alpina



Woodsia glabella



Woodsia ilvensis

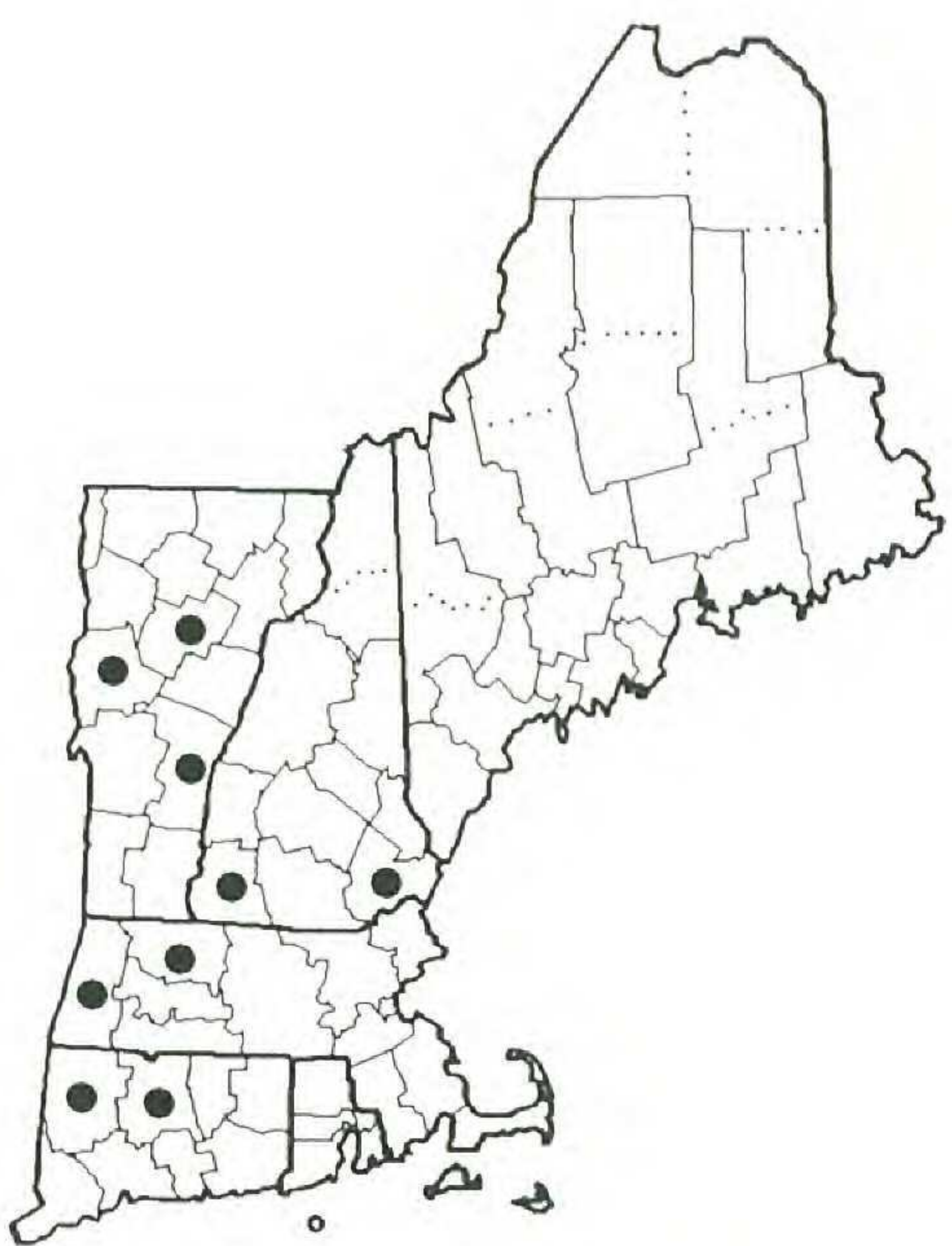


Woodsia obtusa

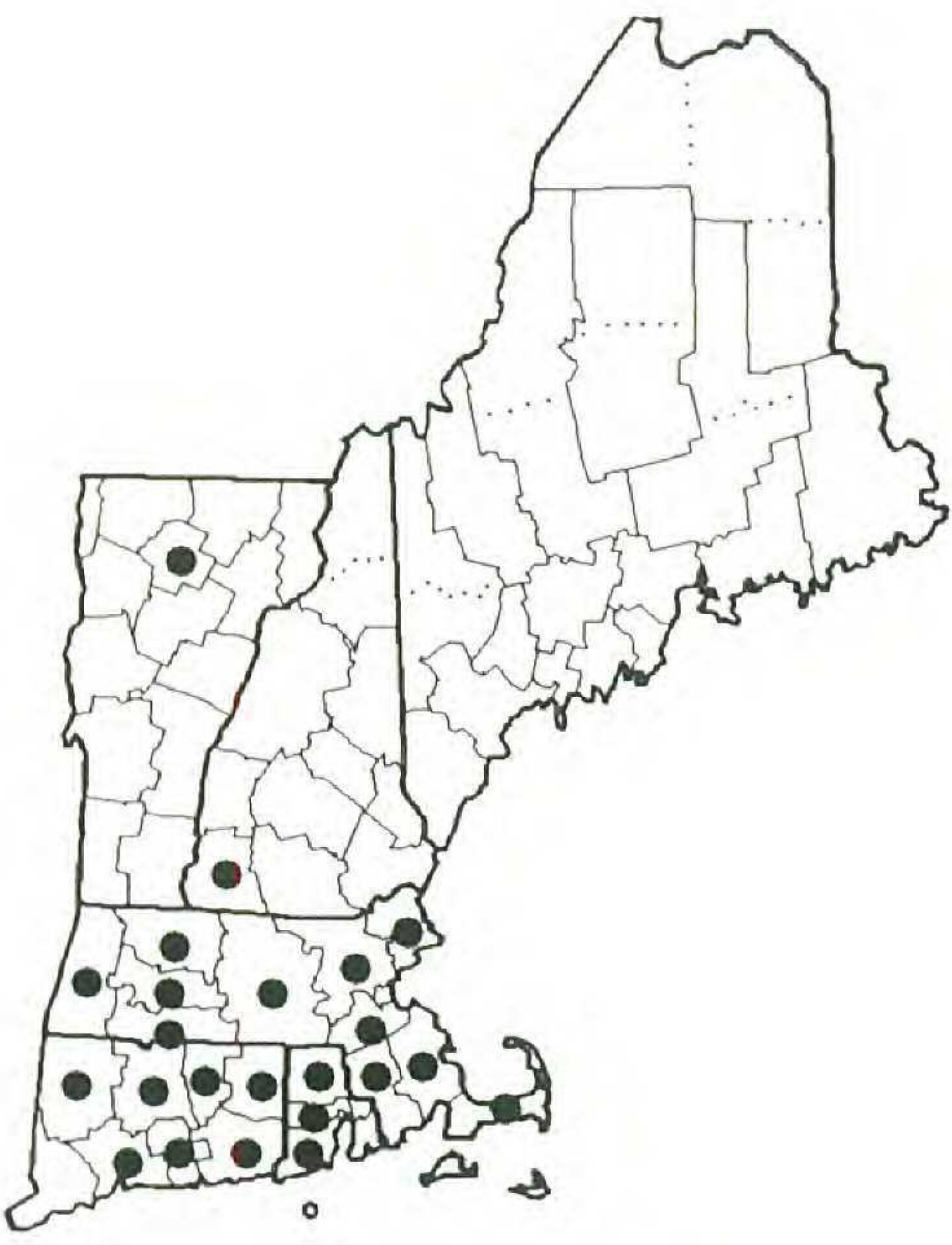
Figure 29. Distribution maps for *Woodsia alpina*, *W. glabella*, *W. ilvensis*, and *W. obtusa*.



Woodsia x gracilis



Trichomanes intricatum

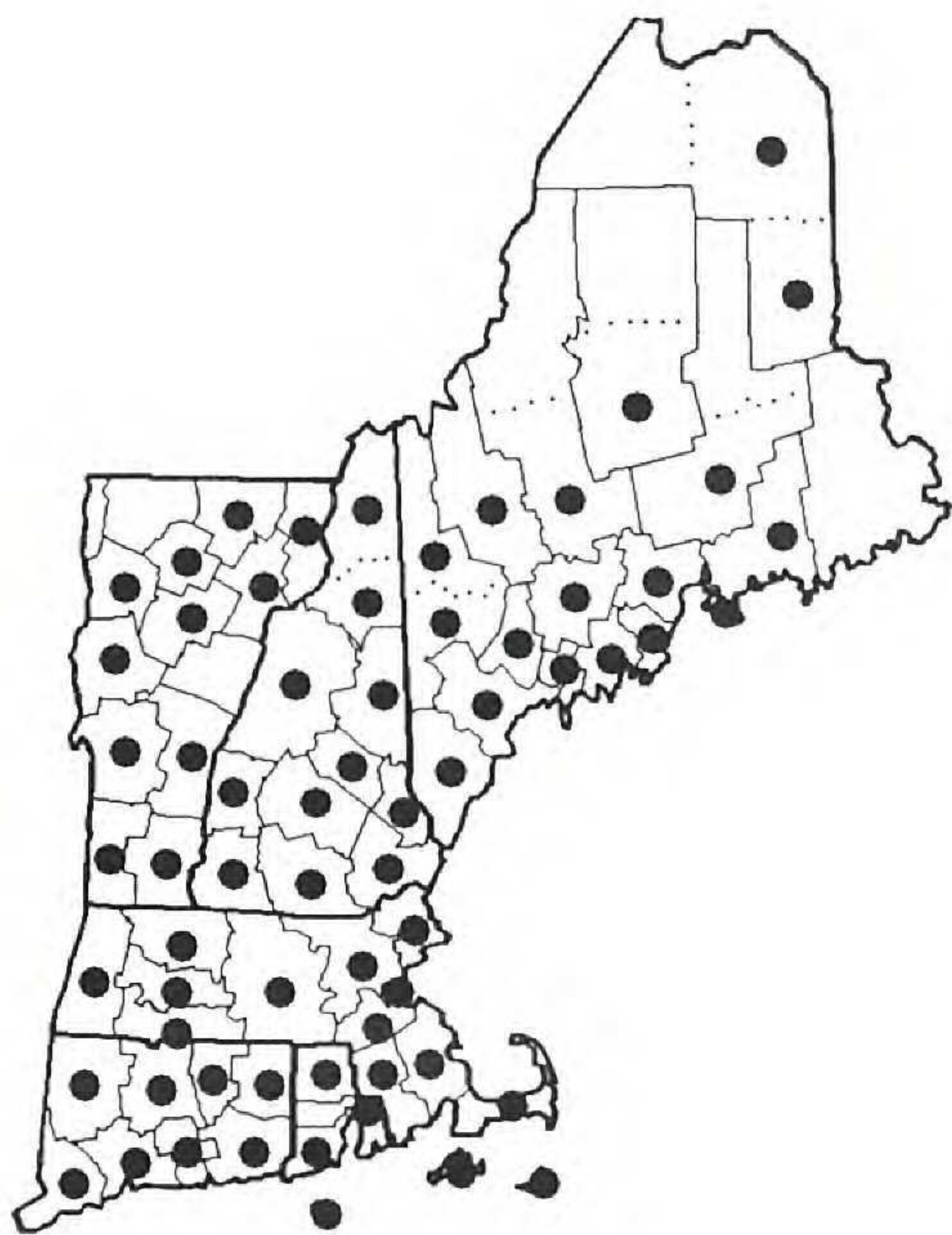


Lygodium palmatum

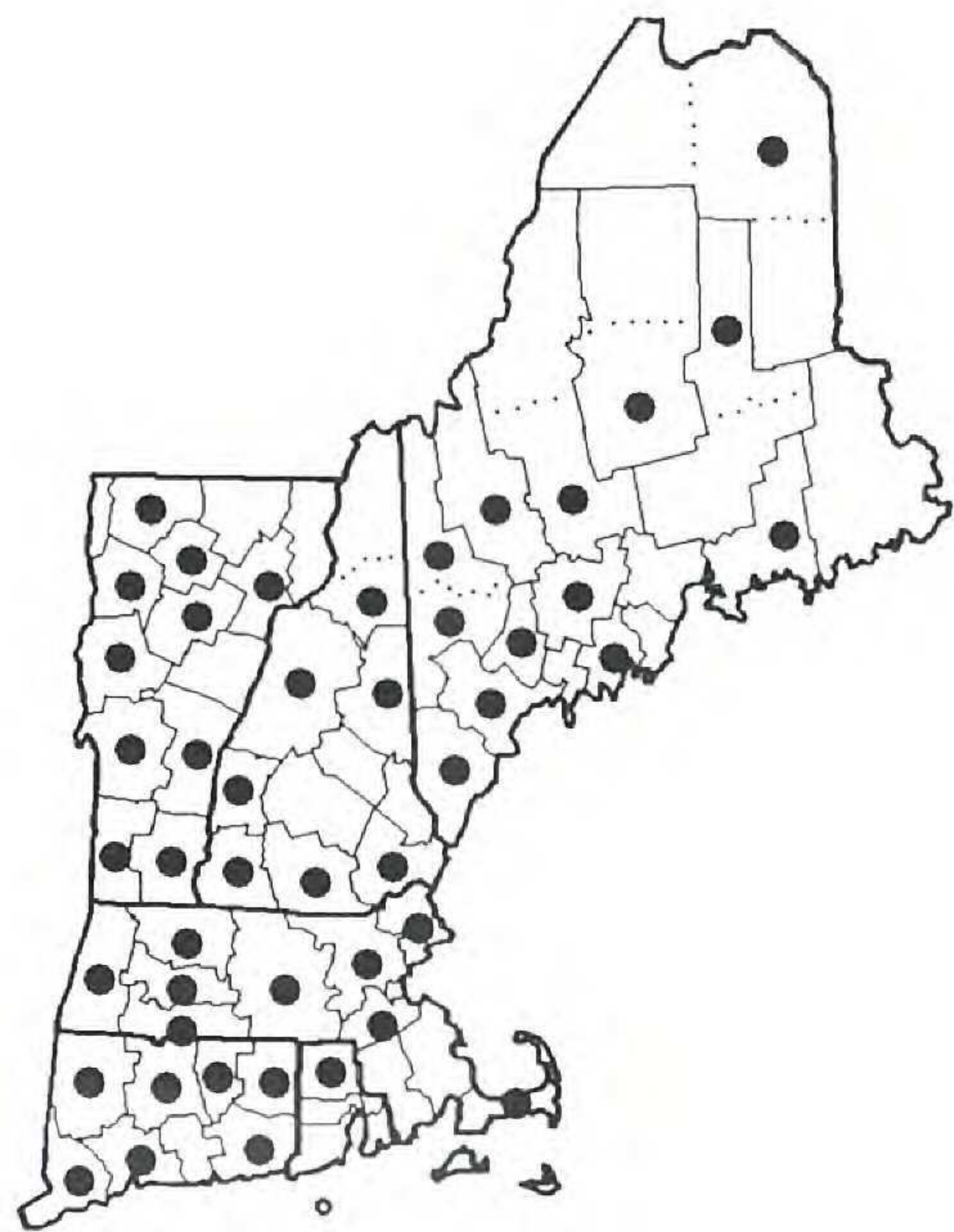


MARSILEA QUADRIFOLIA

Figure 30. Distribution maps for *Woodsia x gracilis*, *Trichomanes intricatum*, *Lygodium palmatum*, and *MARSILEA QUADRIFOLIA*.



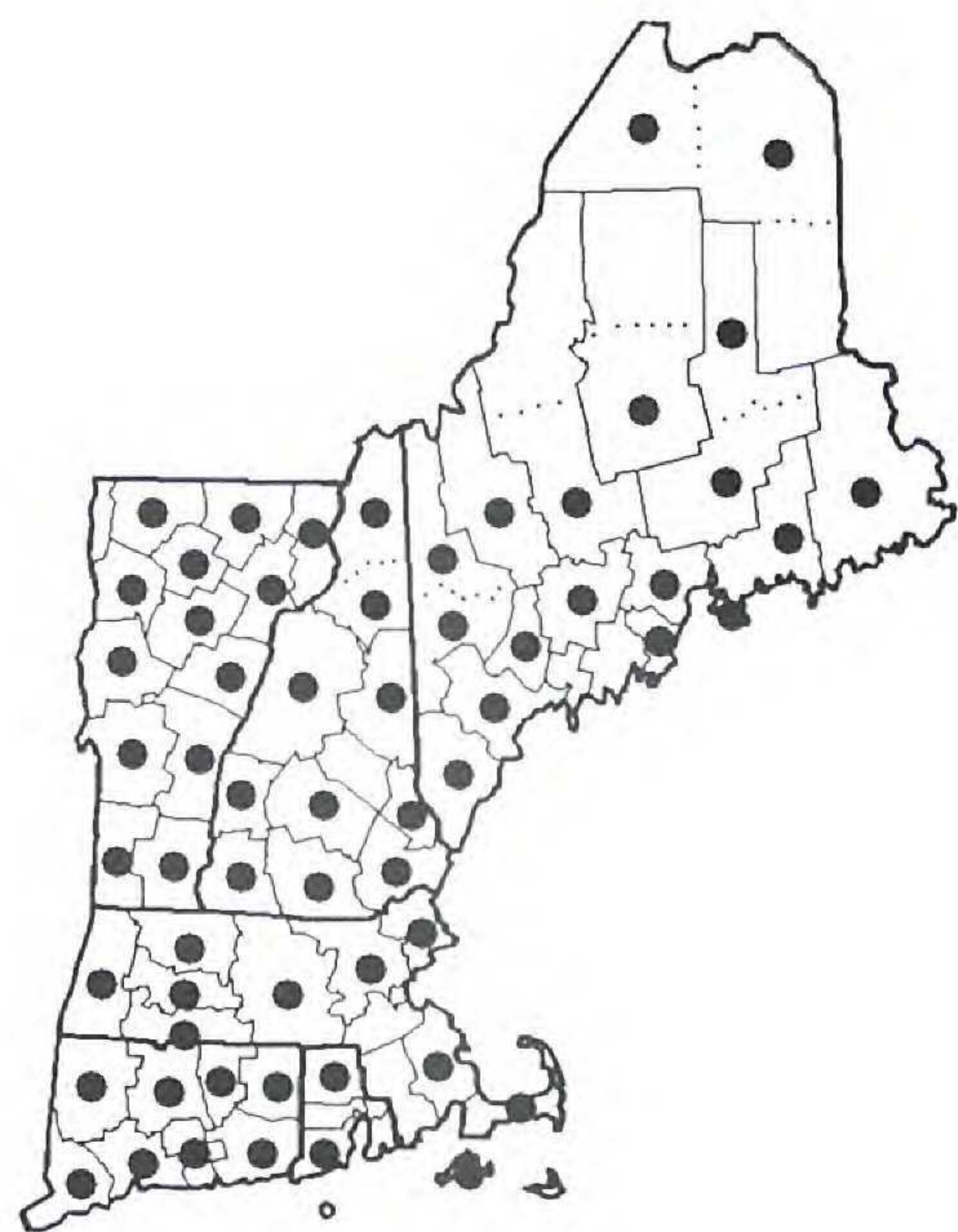
Botrychium dissectum



Botrychium lanceolatum
subsp. *angustisegmentum*



Botrychium lunaria

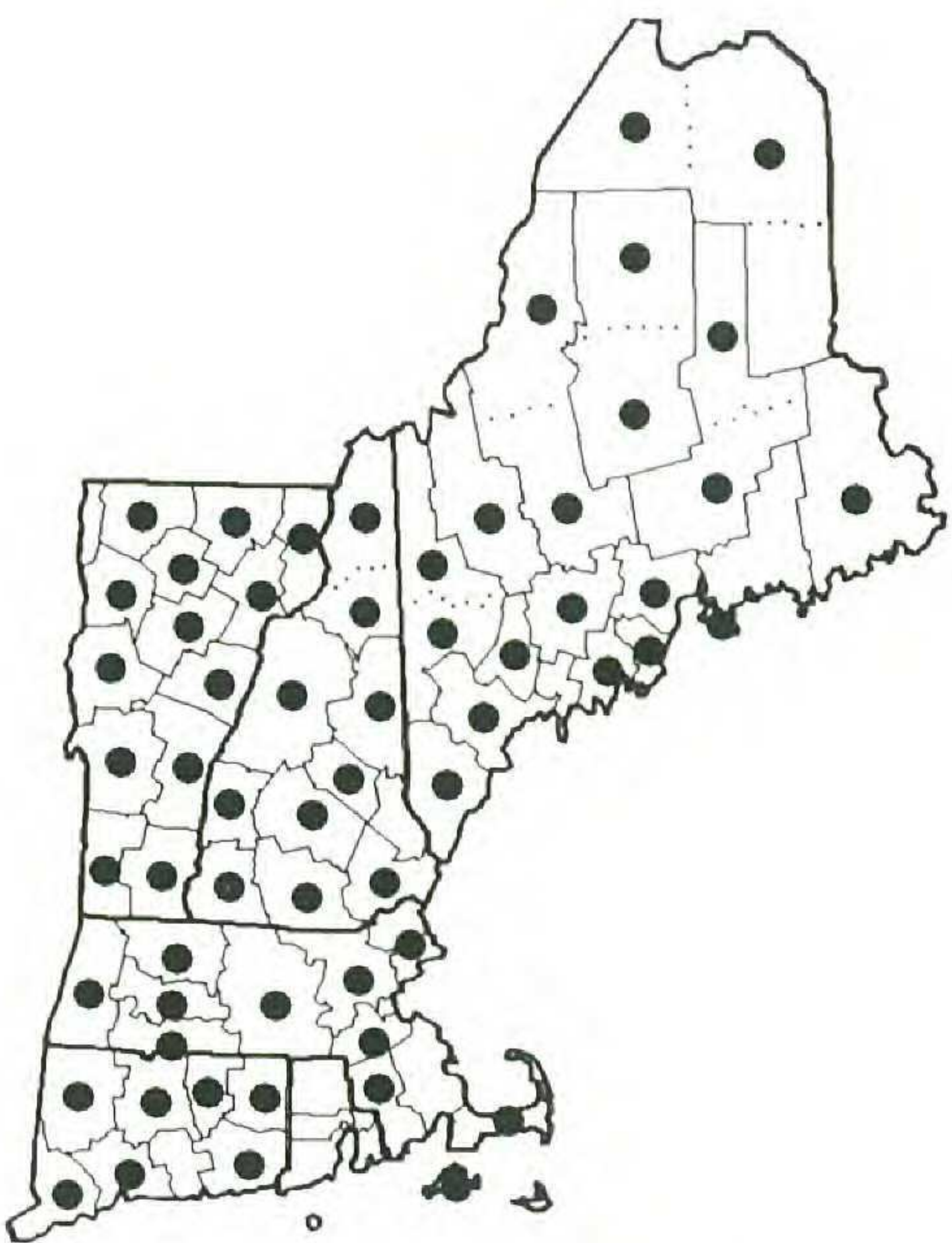


Botrychium matricariifolium

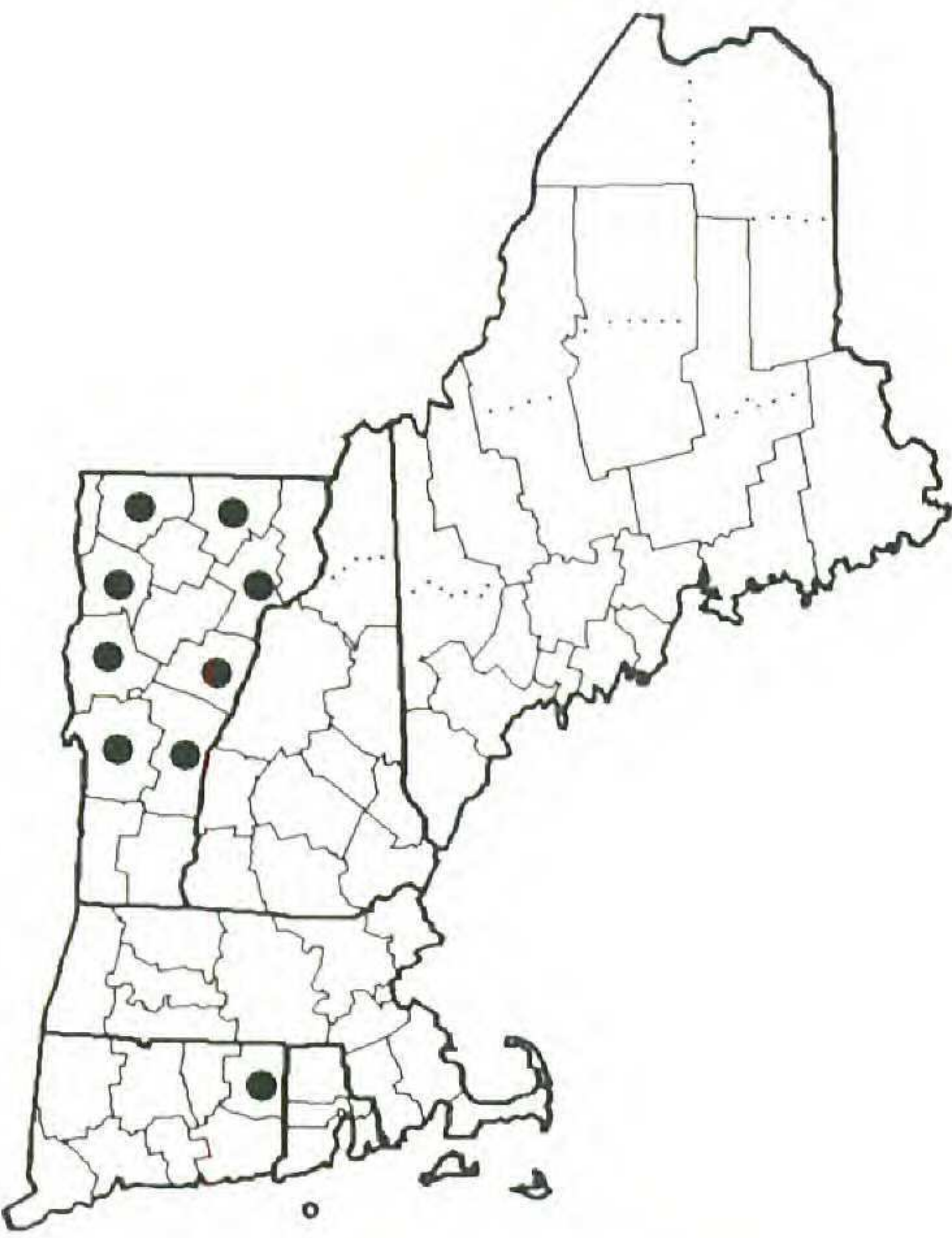
Figure 31. Distribution maps for *Botrychium dissectum*, *B. lanceolatum* subsp. *angustisegmentum*, *B. lunaria*, and *B. matricariifolium*.



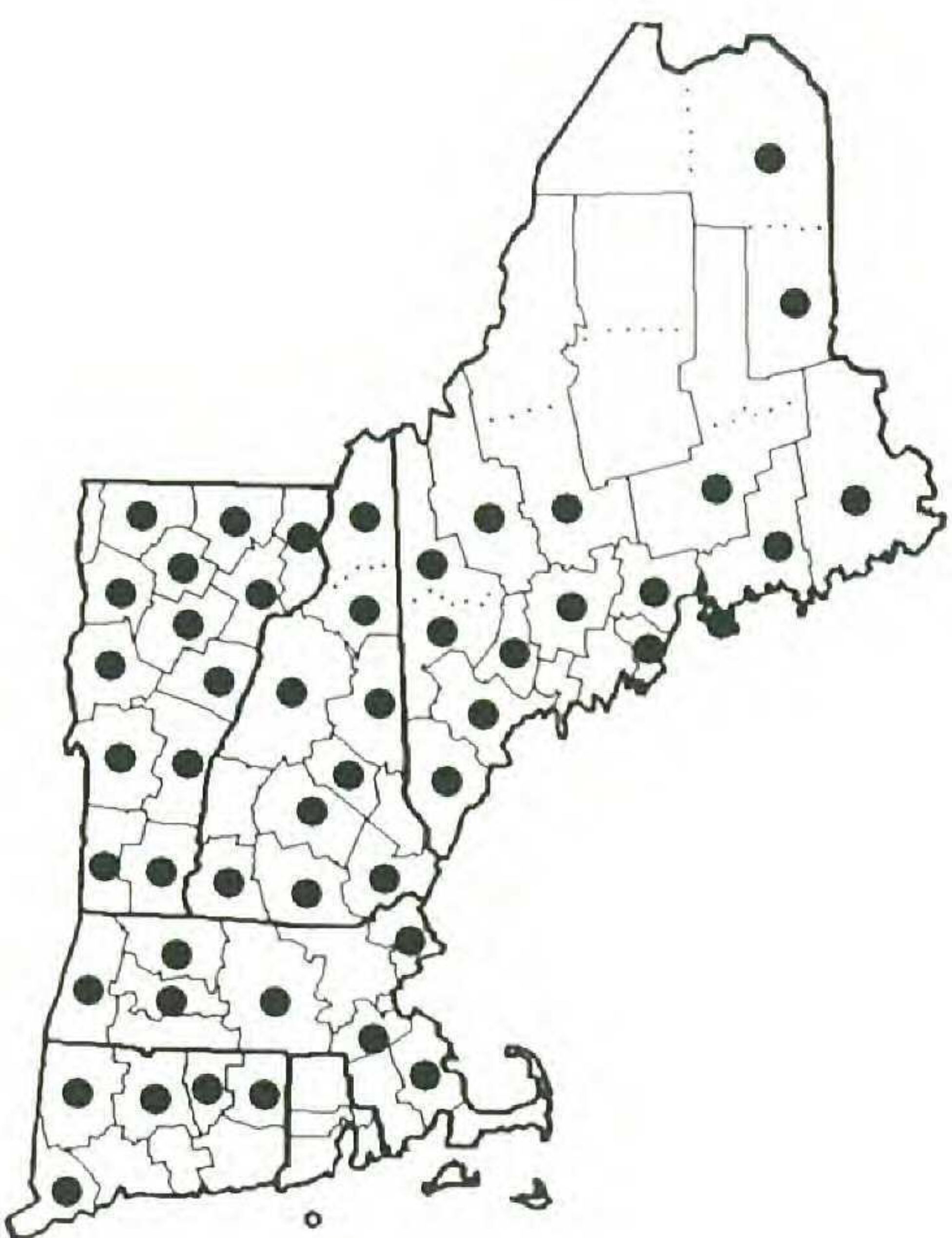
Botrychium minganense



Botrychium multifidum

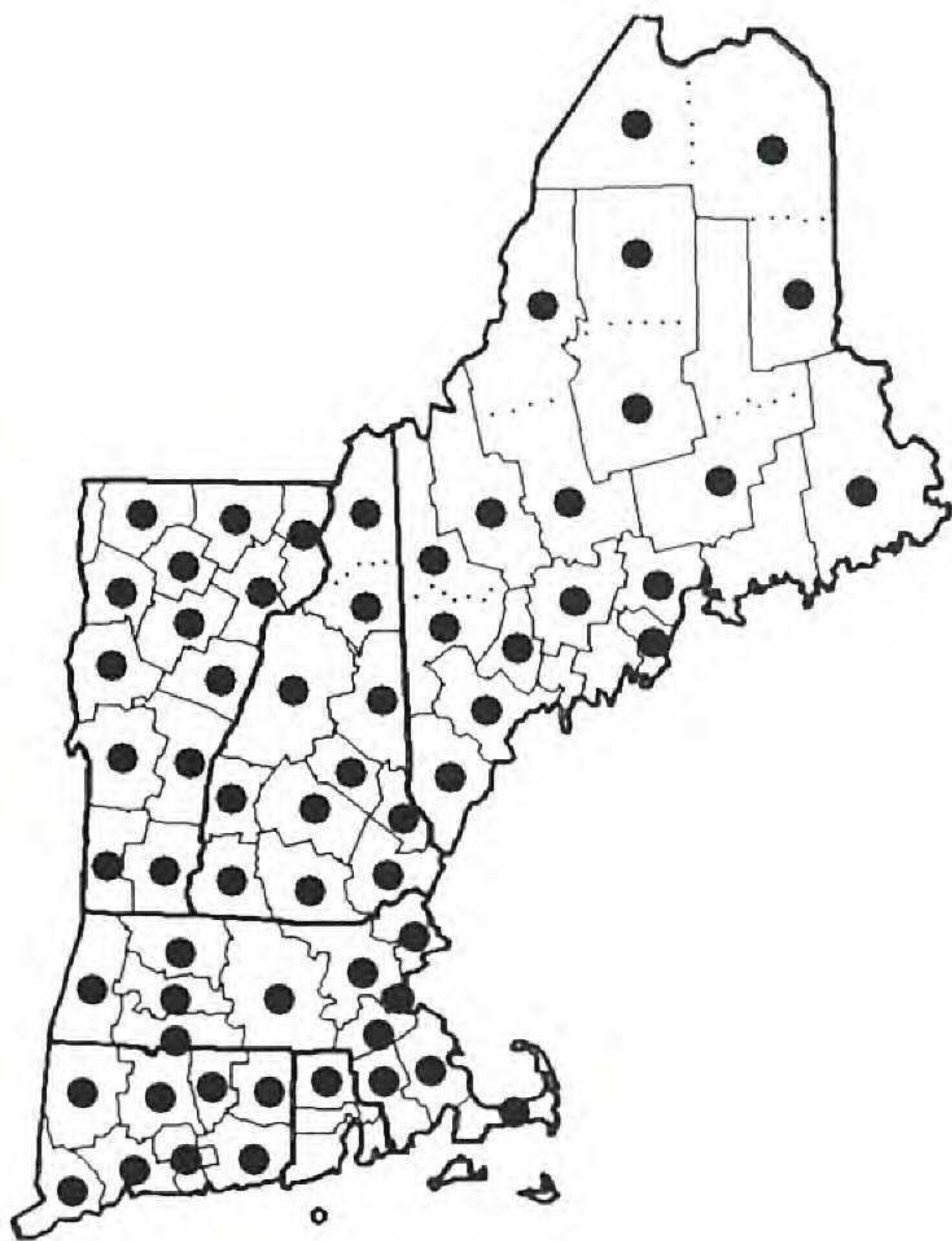


Botrychium rugulosum

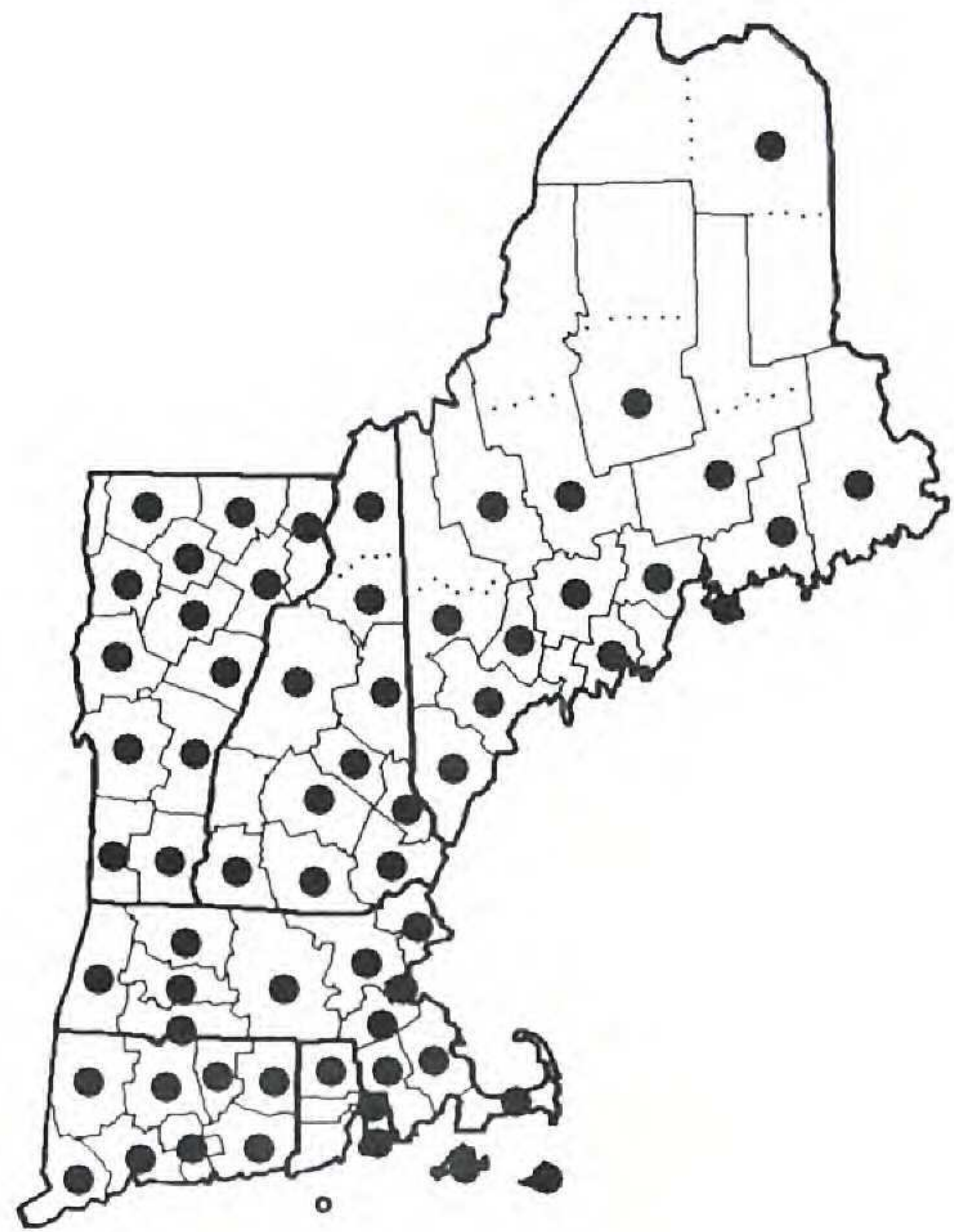


Botrychium simplex

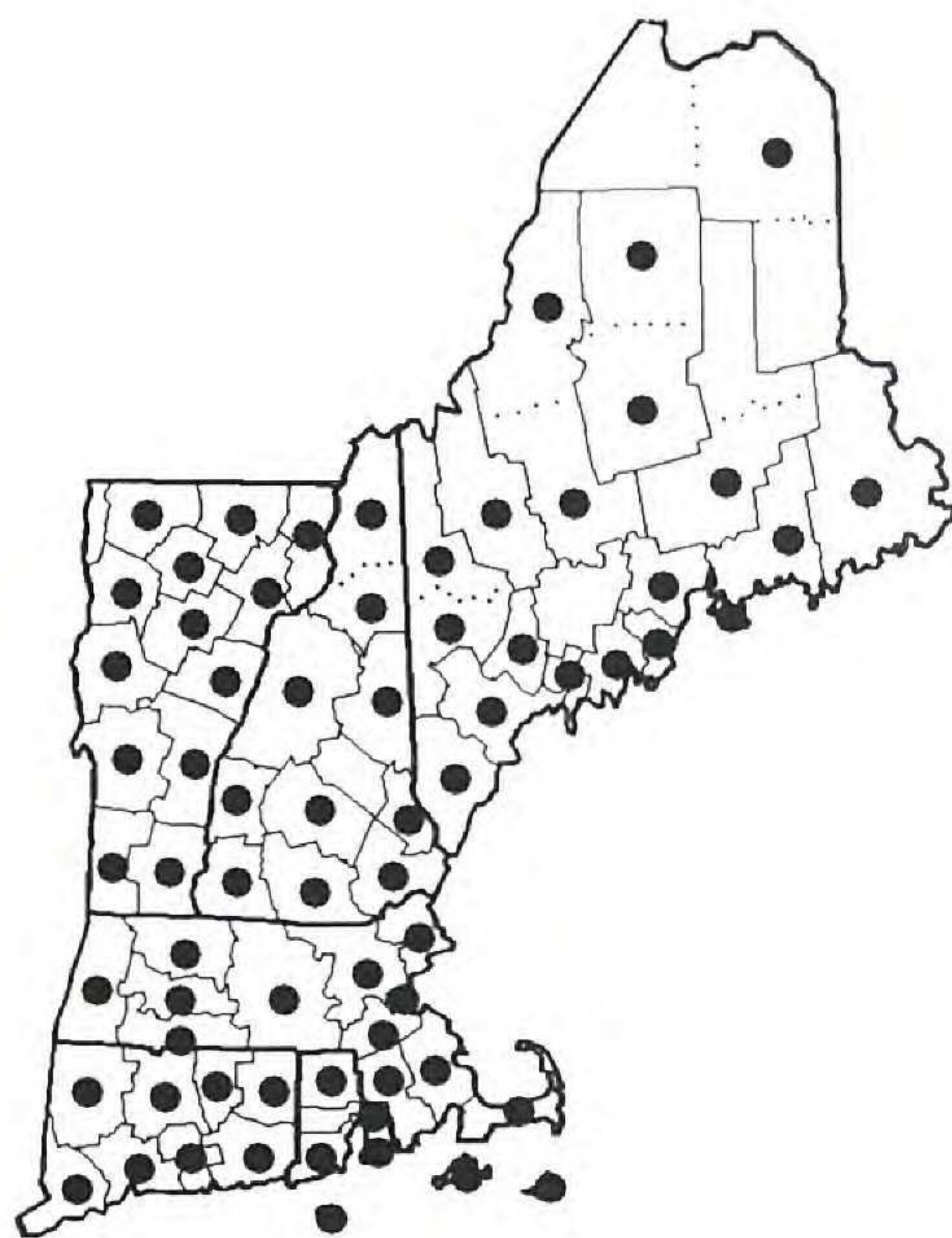
Figure 32. Distribution maps for *Botrychium minganense*, *B. multifidum*, *B. rugulosum*, and *B. simplex*.



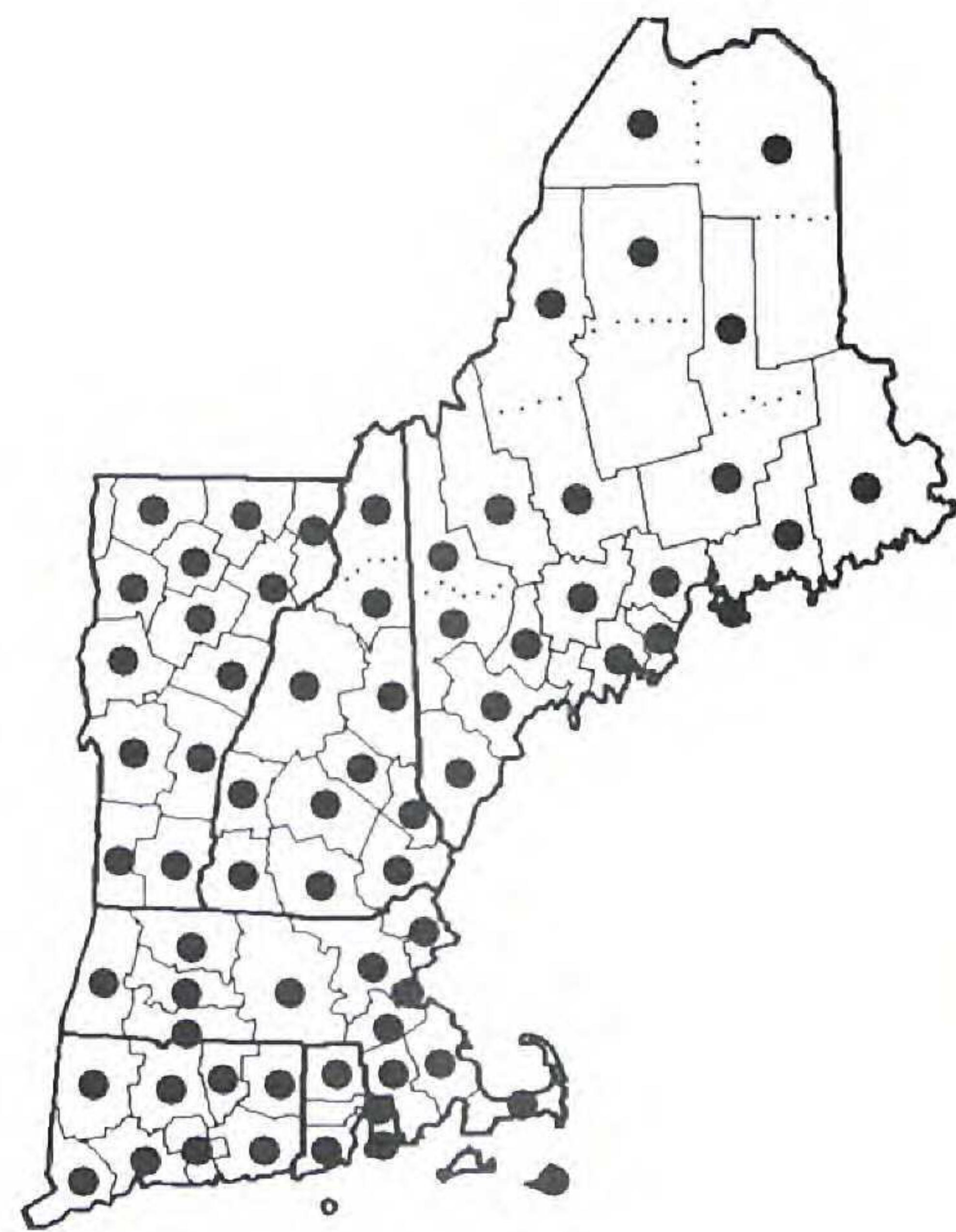
Botrychium virginianum



Ophioglossum pusillum



Osmunda cinnamomea



Osmunda claytoniana

Figure 33. Distribution maps for *Botrychium virginianum*, *Ophioglossum pusillum*, *Osmunda cinnamomea*, and *O. claytoniana*.

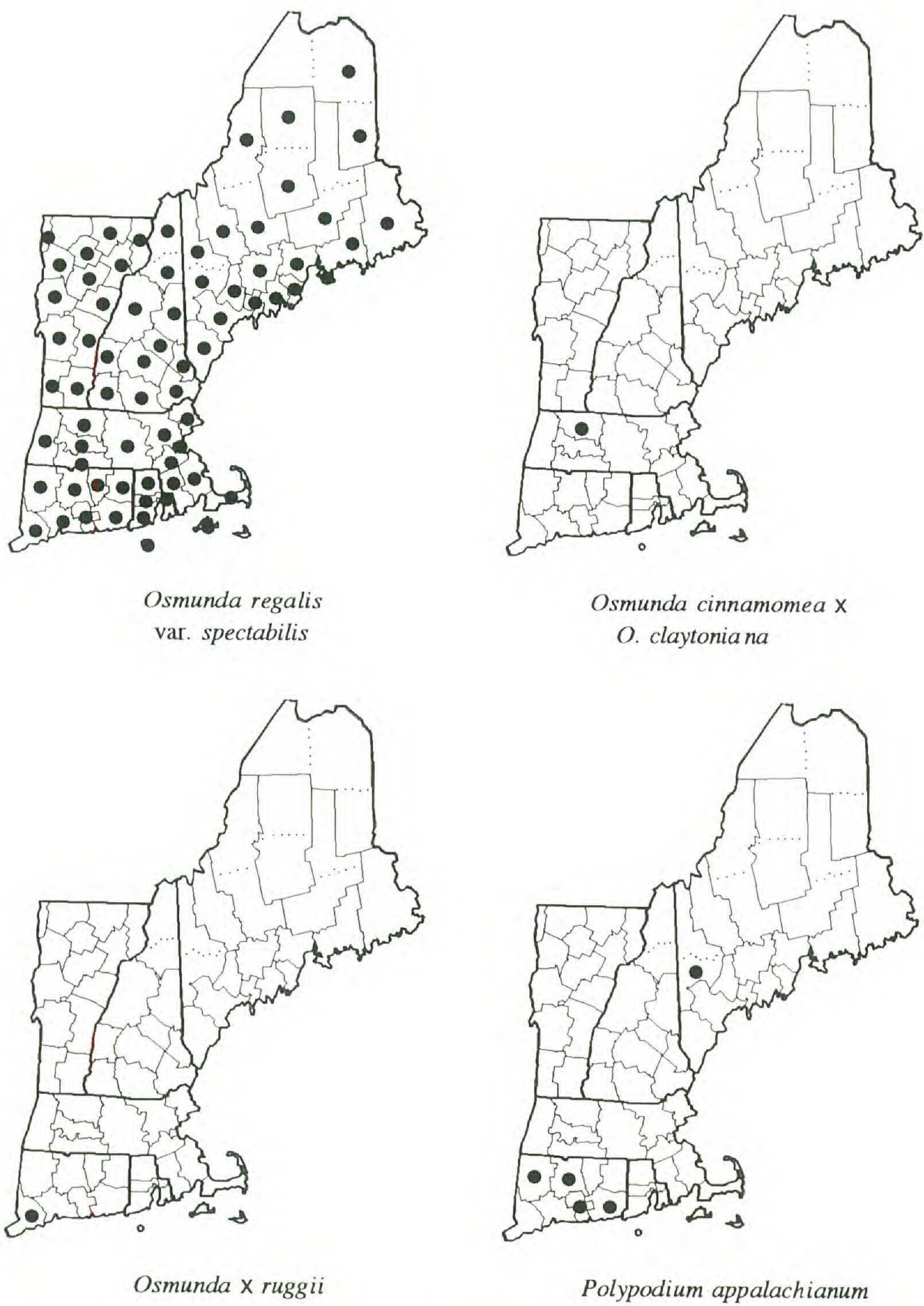
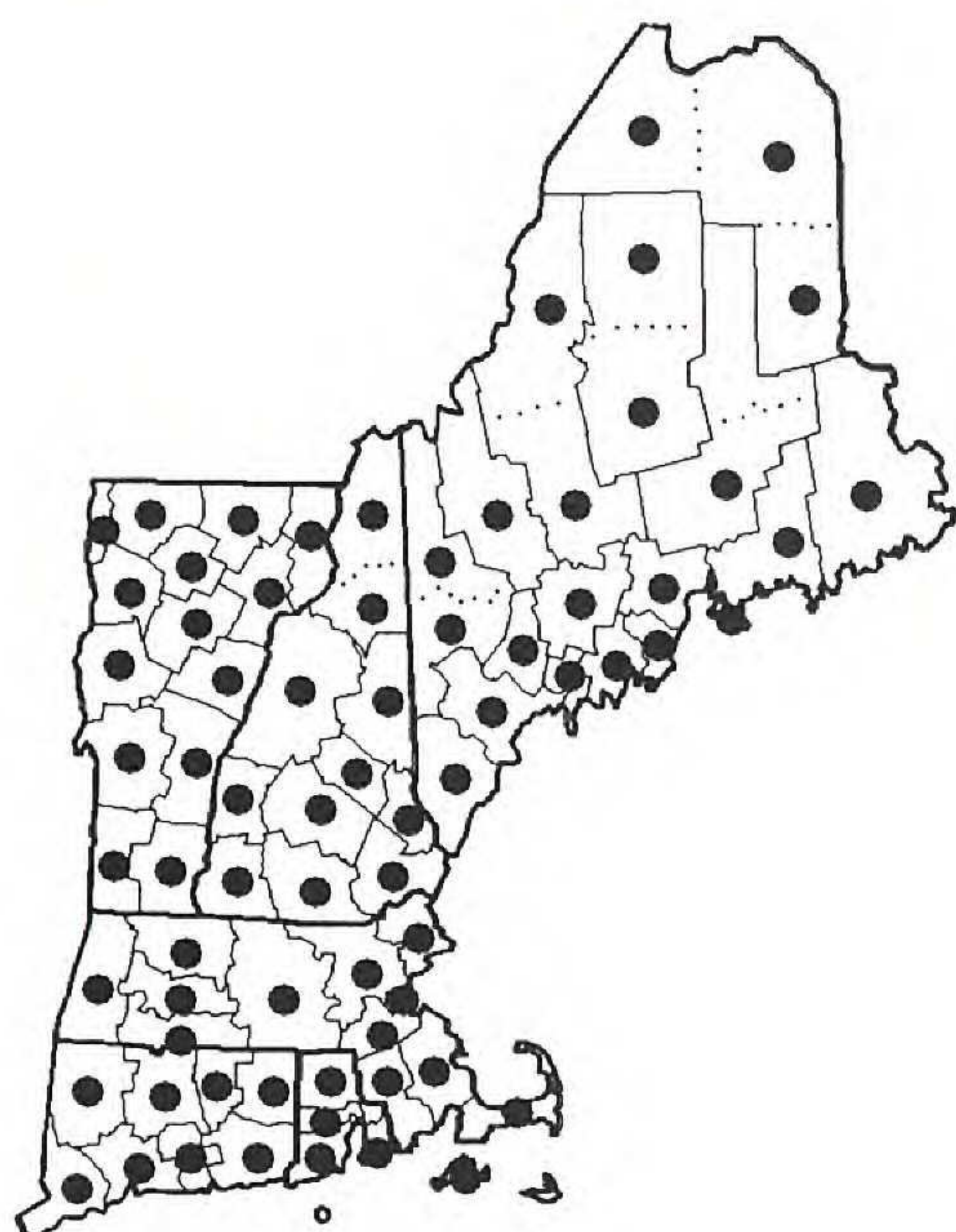


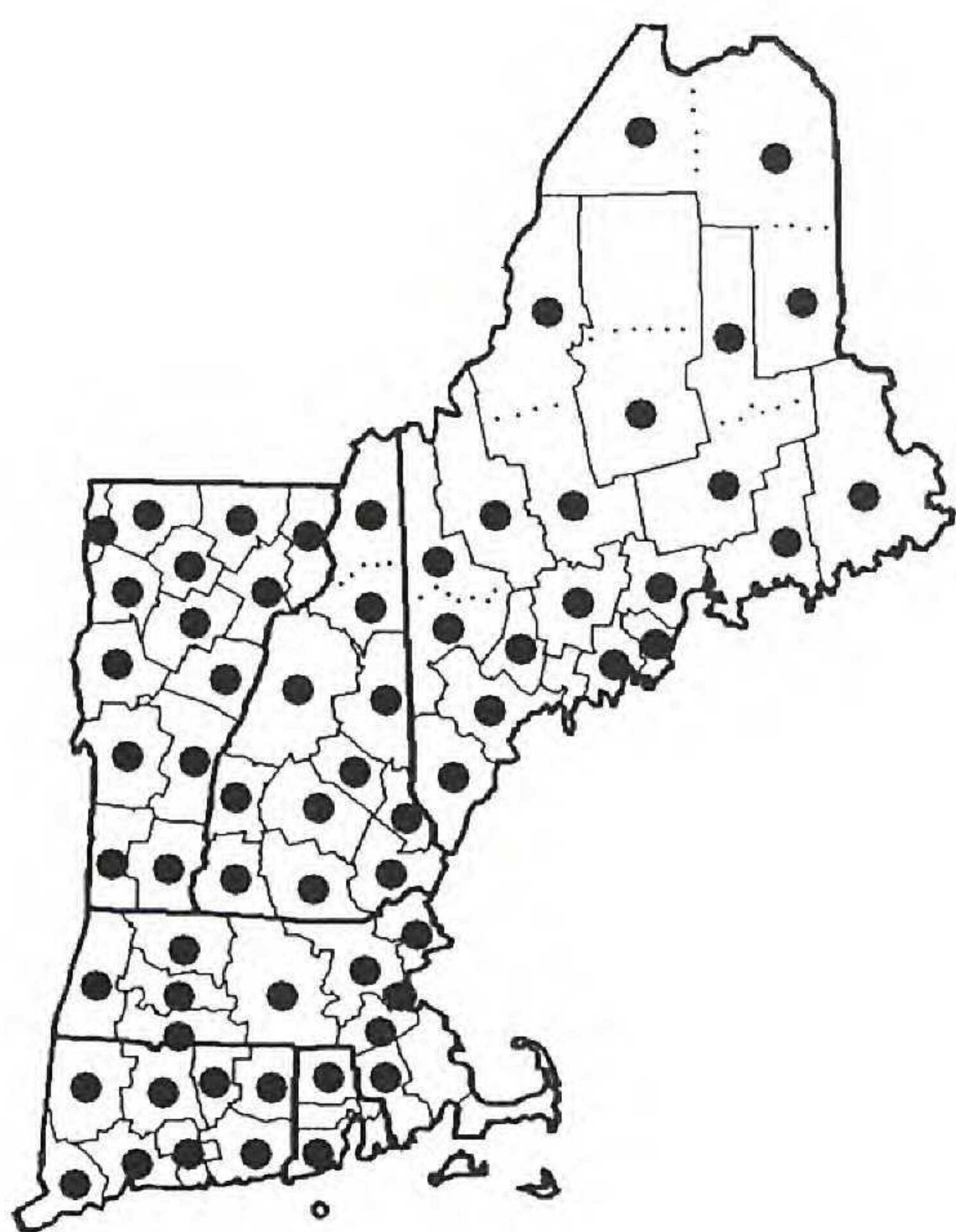
Figure 34. Distribution maps for *Osmunda regalis* var. *spectabilis*, *O. cinnamomea* x *O. claytoniana*, *O. x ruggii*, and *Polypodium appalachianum*.



Polypodium virginianum



Adiantum aleuticum



Adiantum pedatum



Adiantum x viridimontanum

Figure 35. Distribution maps for *Polypodium virginianum*, *Adiantum aleuticum*, *A. pedatum*, and *A. x viridimontanum*.

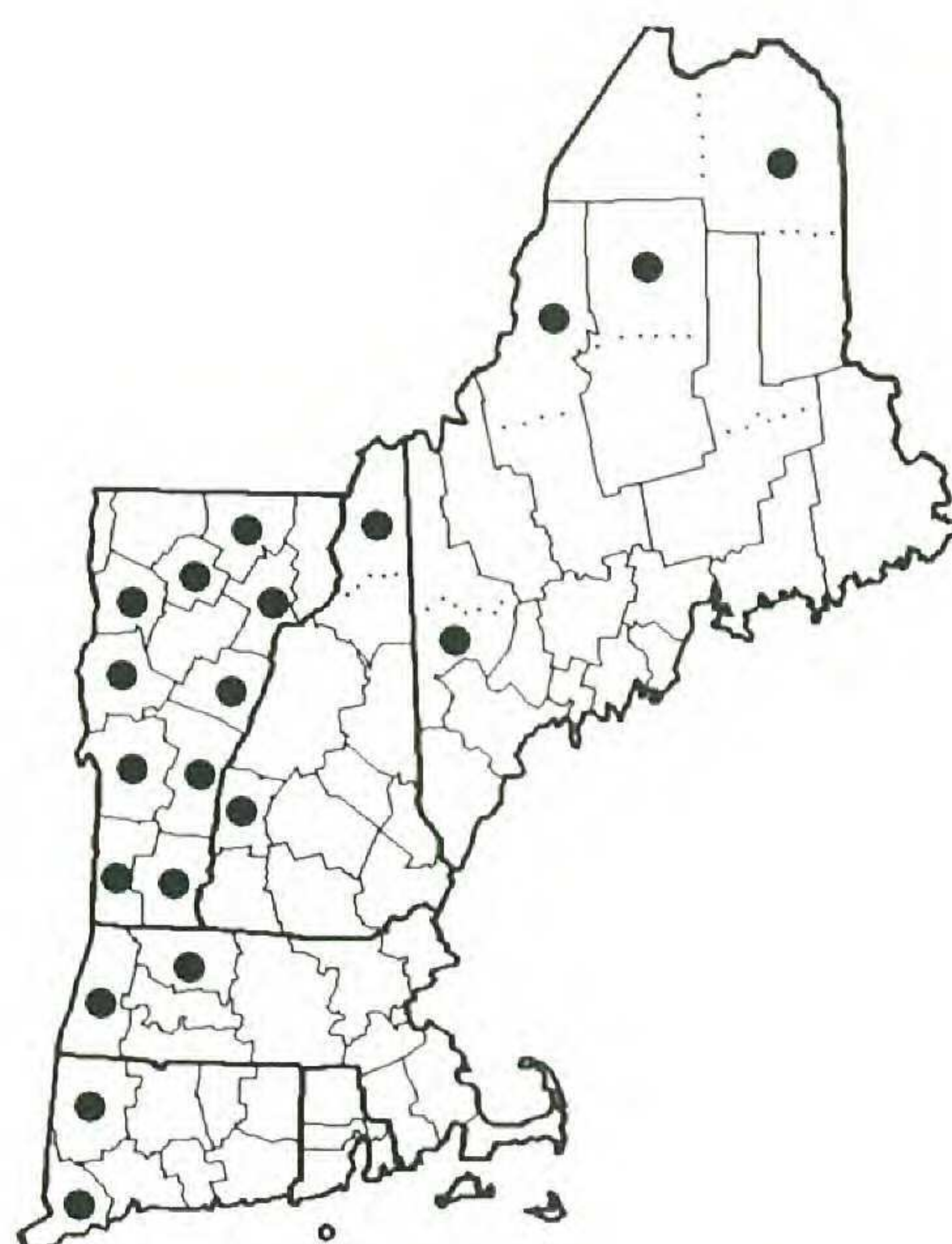
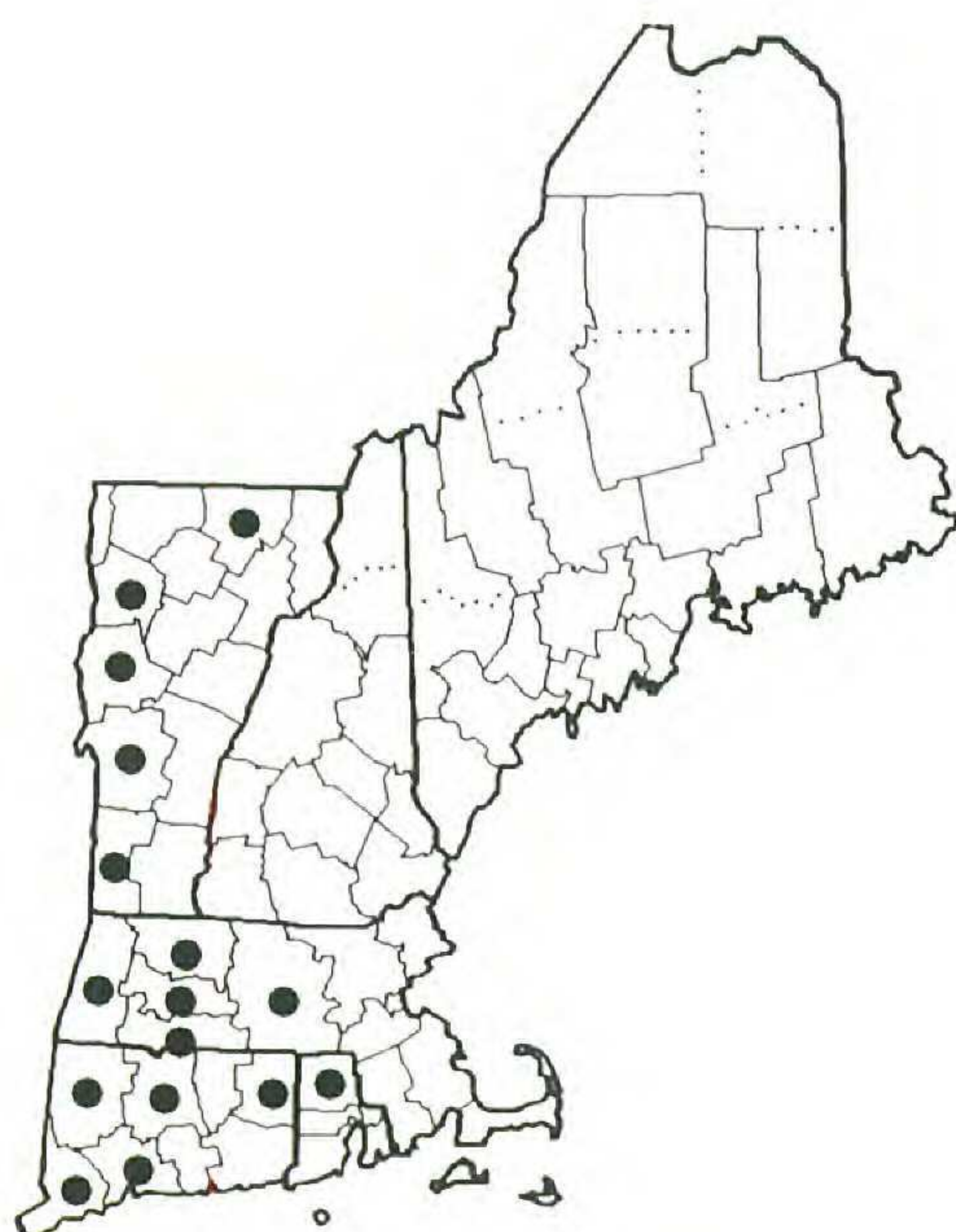
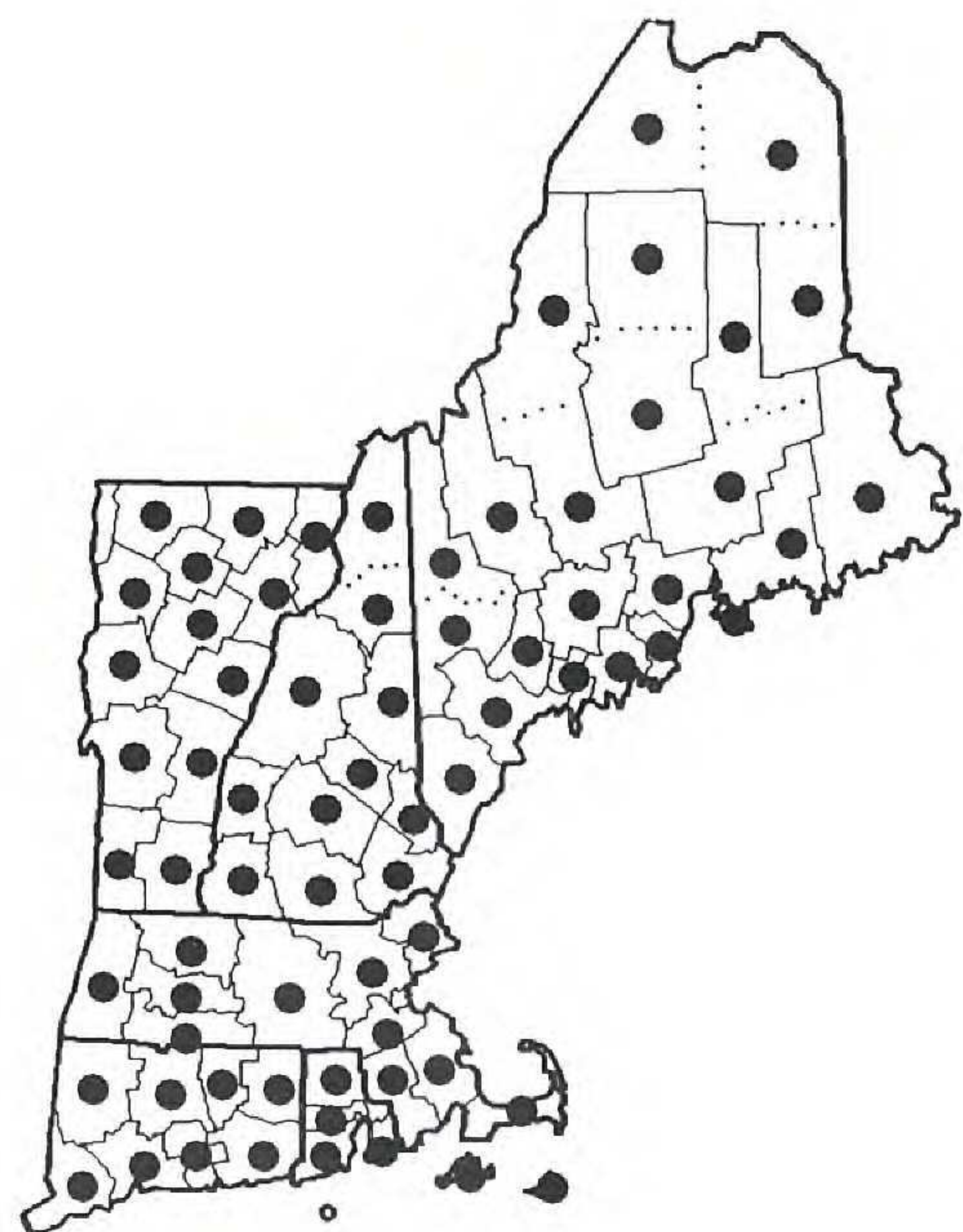
*Cheilanthes lanosa**Cryptogramma stelleri**Pellaea atropurpurea**Pellaea glabella*

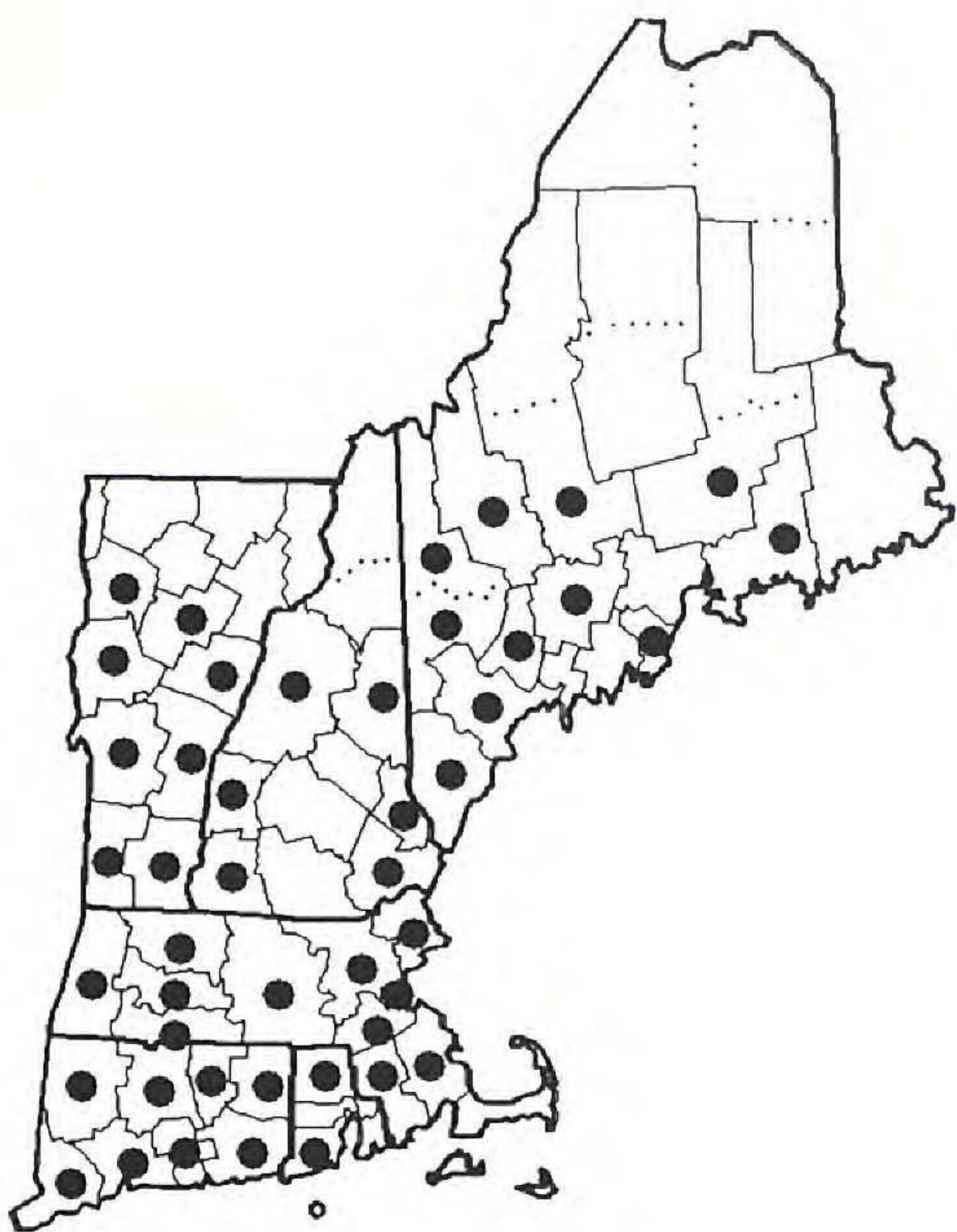
Figure 36. Distribution maps for *Cheilanthes lanosa*, *Cryptogramma stelleri*, *Pellaea atropurpurea*, and *P. glabella*.



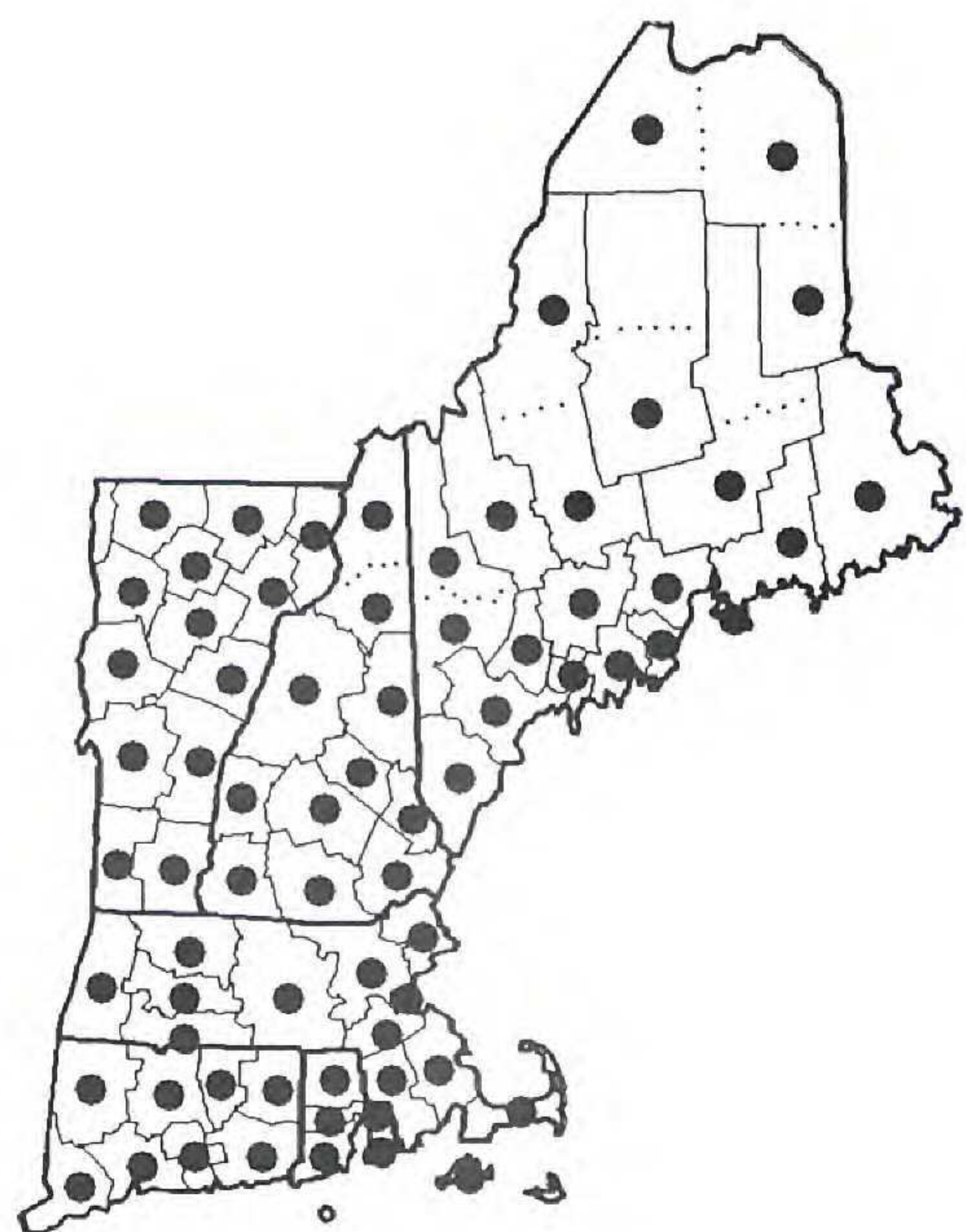
SALVINIA NATANS



Phegopteris connectilis

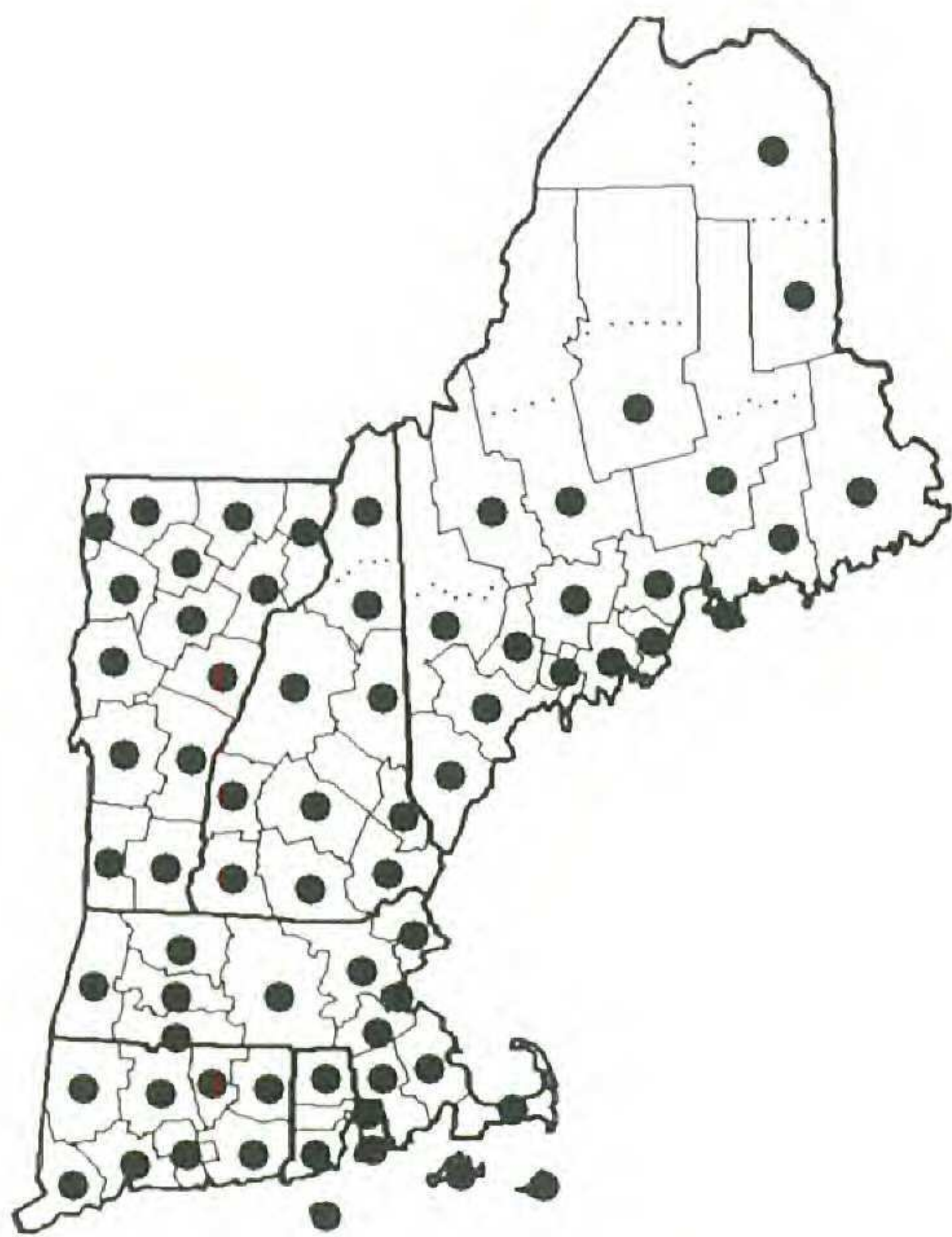


Phegopteris hexagonoptera

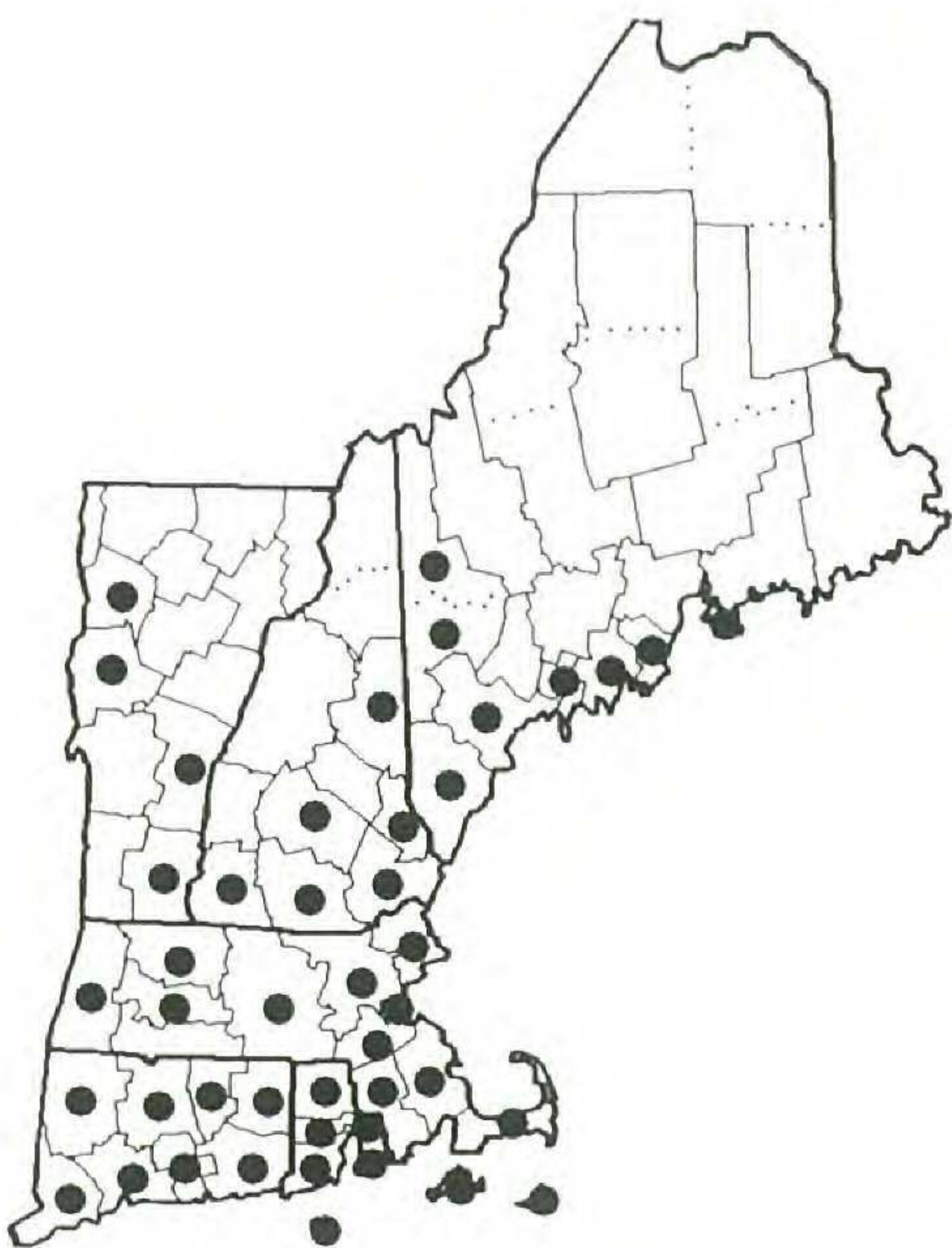


Thelypteris noveboracensis

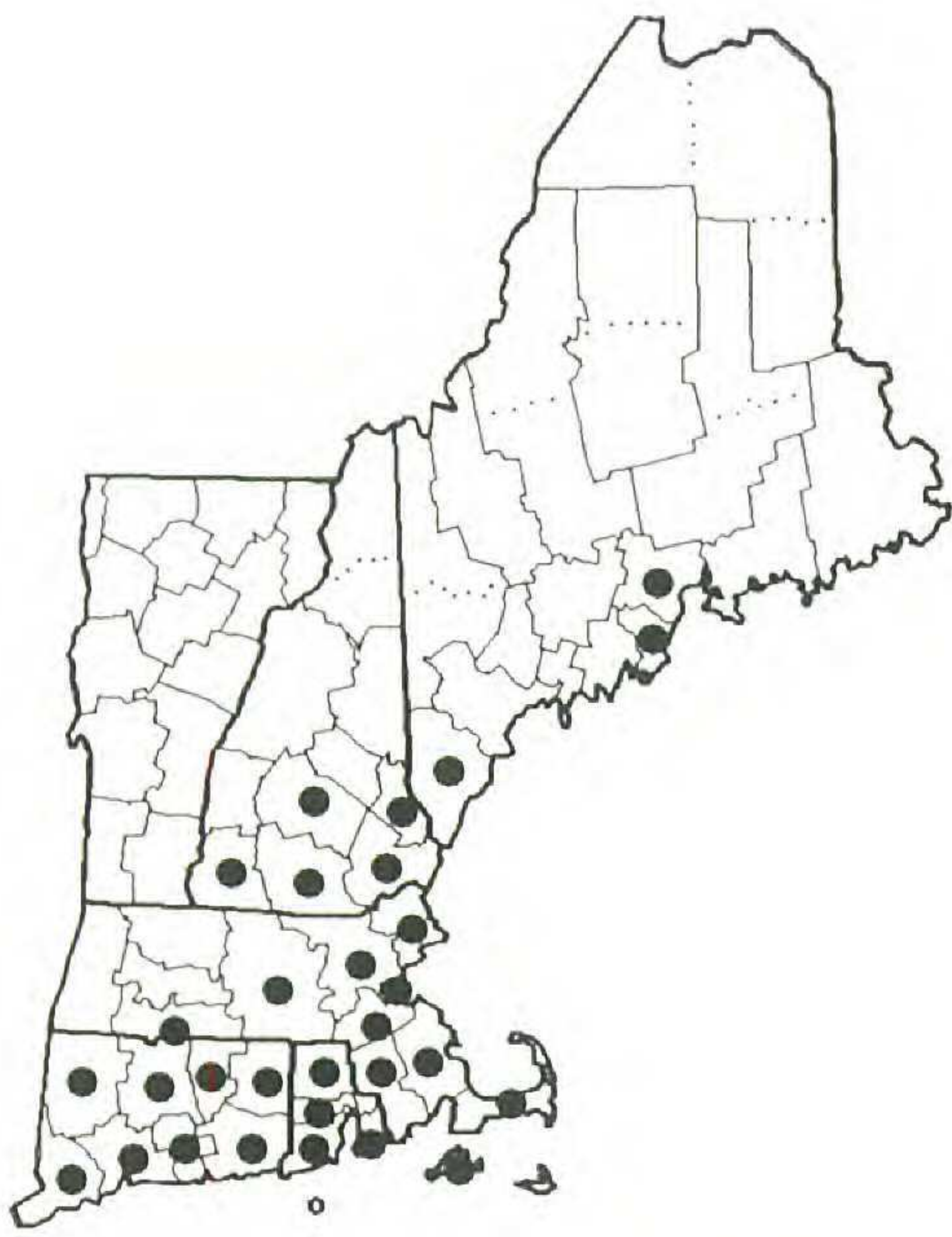
Figure 37. Distribution maps for *SALVINIA NATANS*, *Phegopteris connectilis*, *P. hexagonoptera*, and *Thelypteris noveboracensis*.



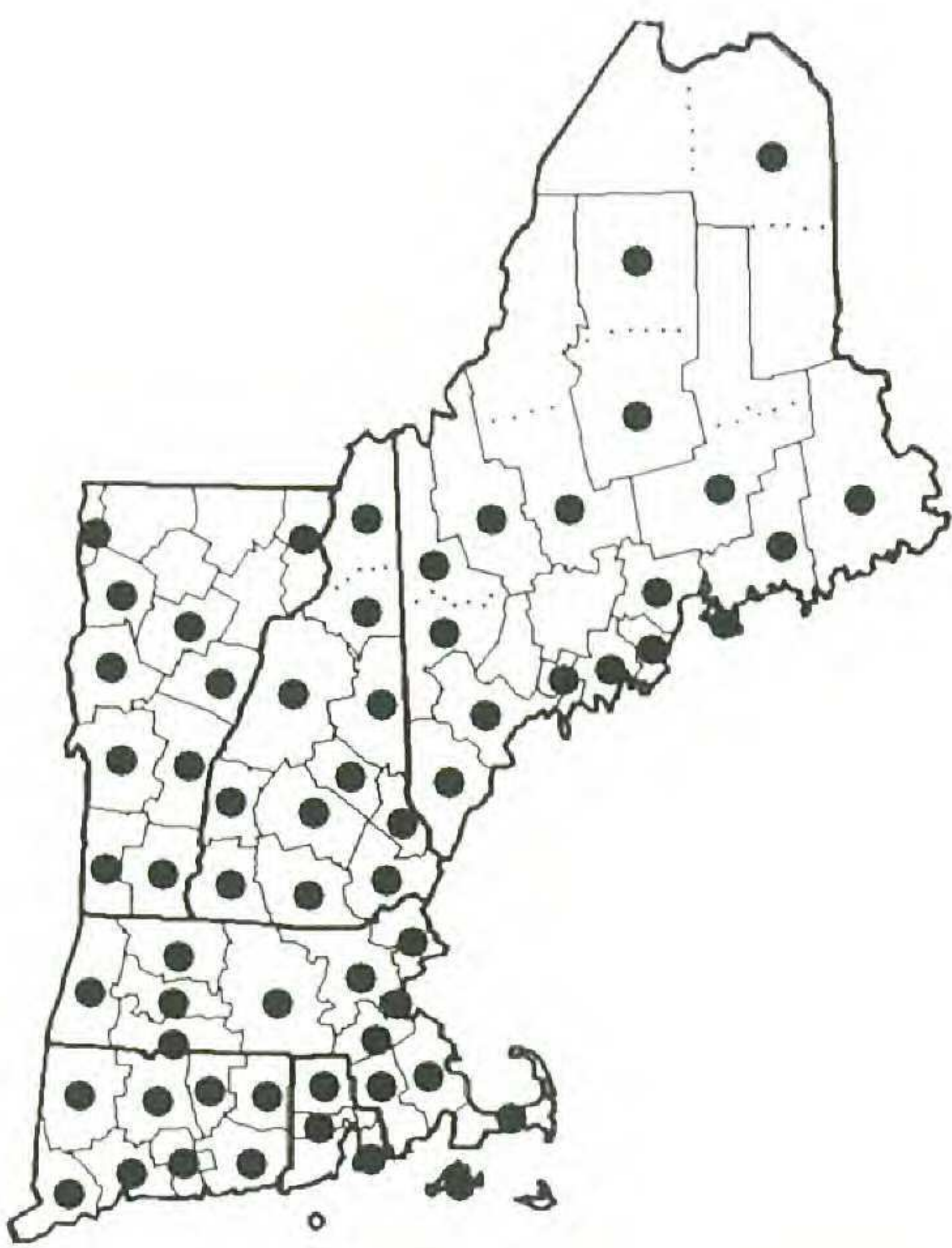
Thelypteris palustris var. *pubescens*



Thelypteris simulata

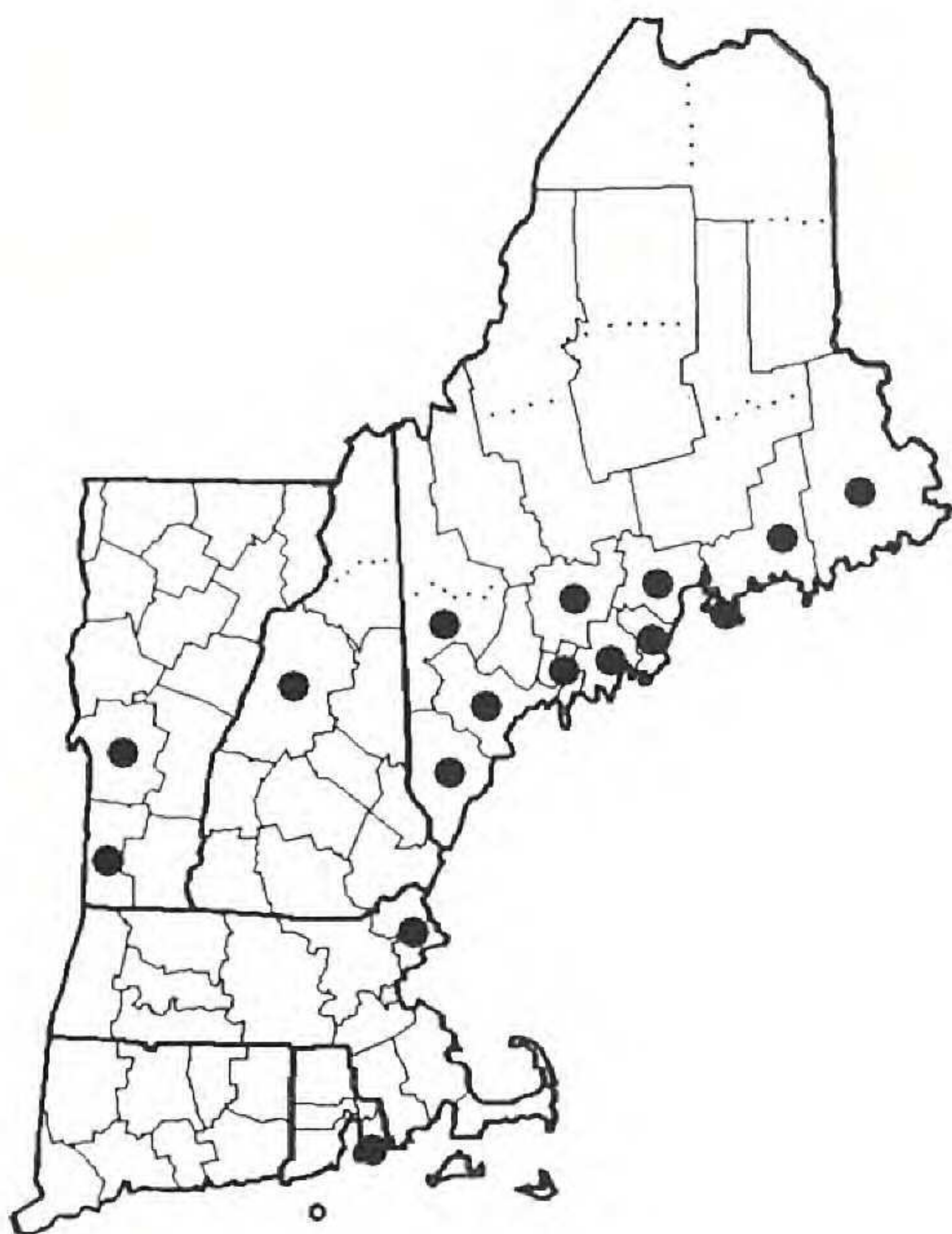


Chamaecyparis thyoides

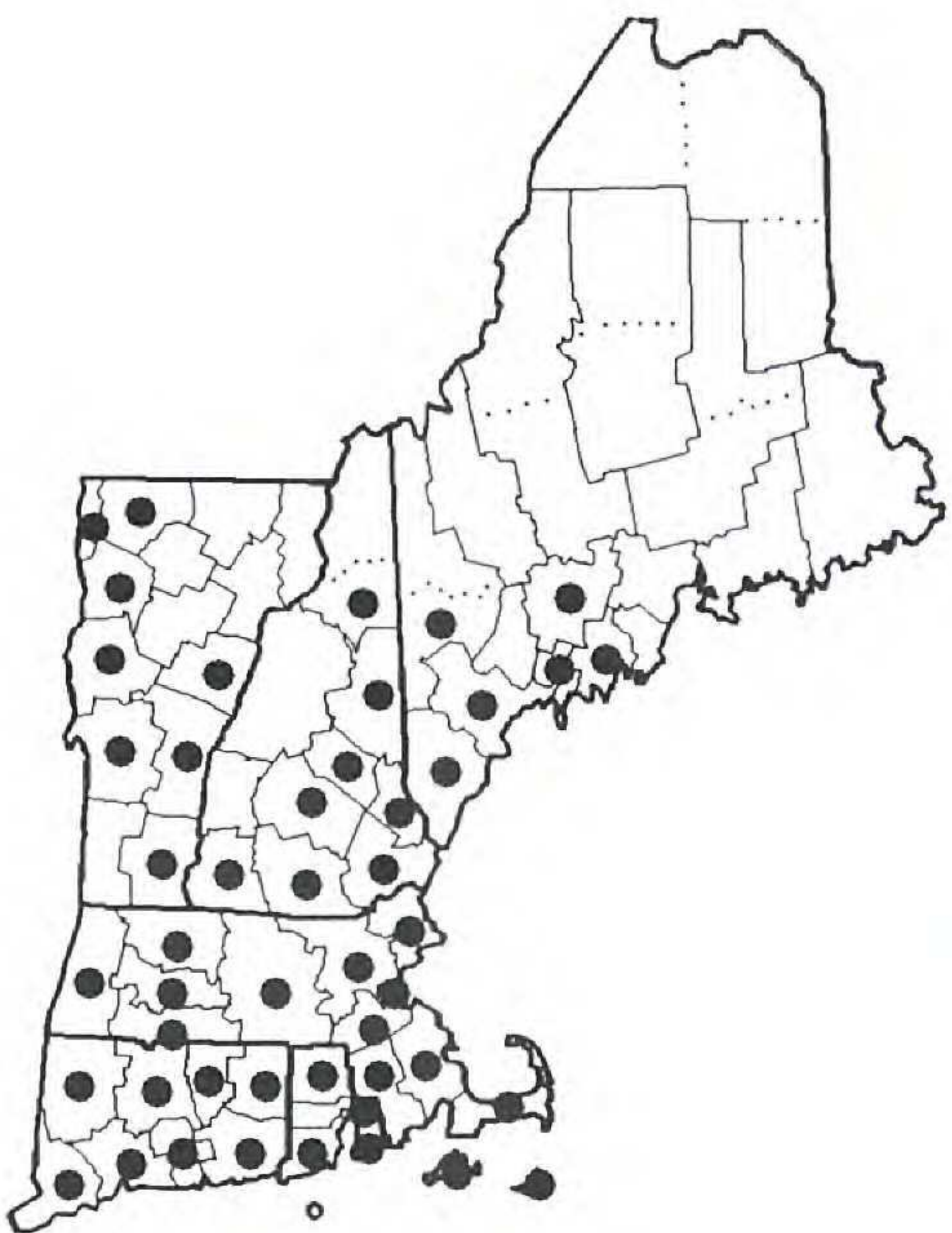


Juniperus communis var. *depressa*

Figure 38. Distribution maps for *Thelypteris palustris* var. *pubescens*, *T. simulata*, *Chamaecyparis thyoides*, and *Juniperus communis* var. *depressa*.



Juniperus horizontalis



Juniperus virginiana

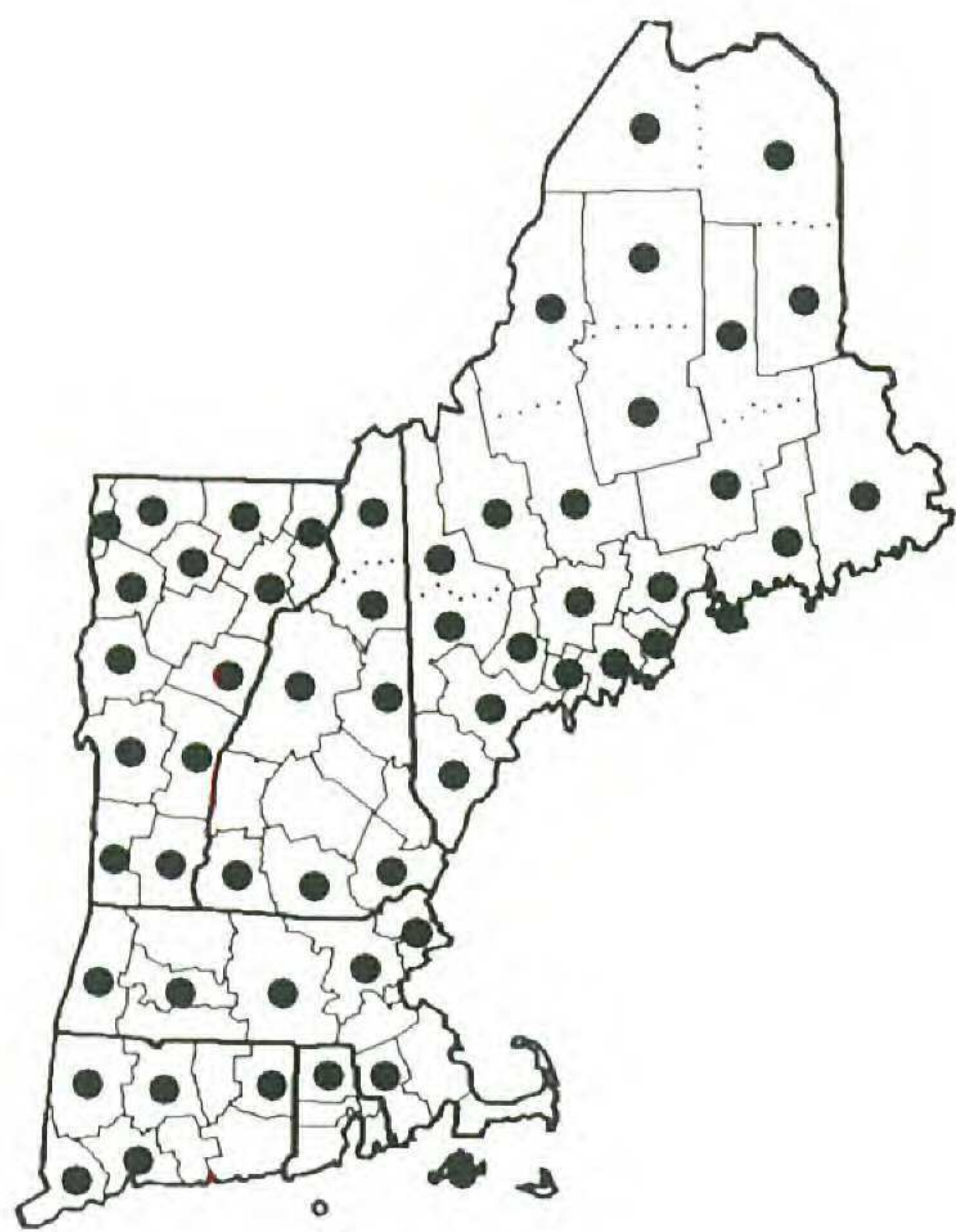


Juniperus communis var. *depressa*
 $\times$ *J. virginiana*

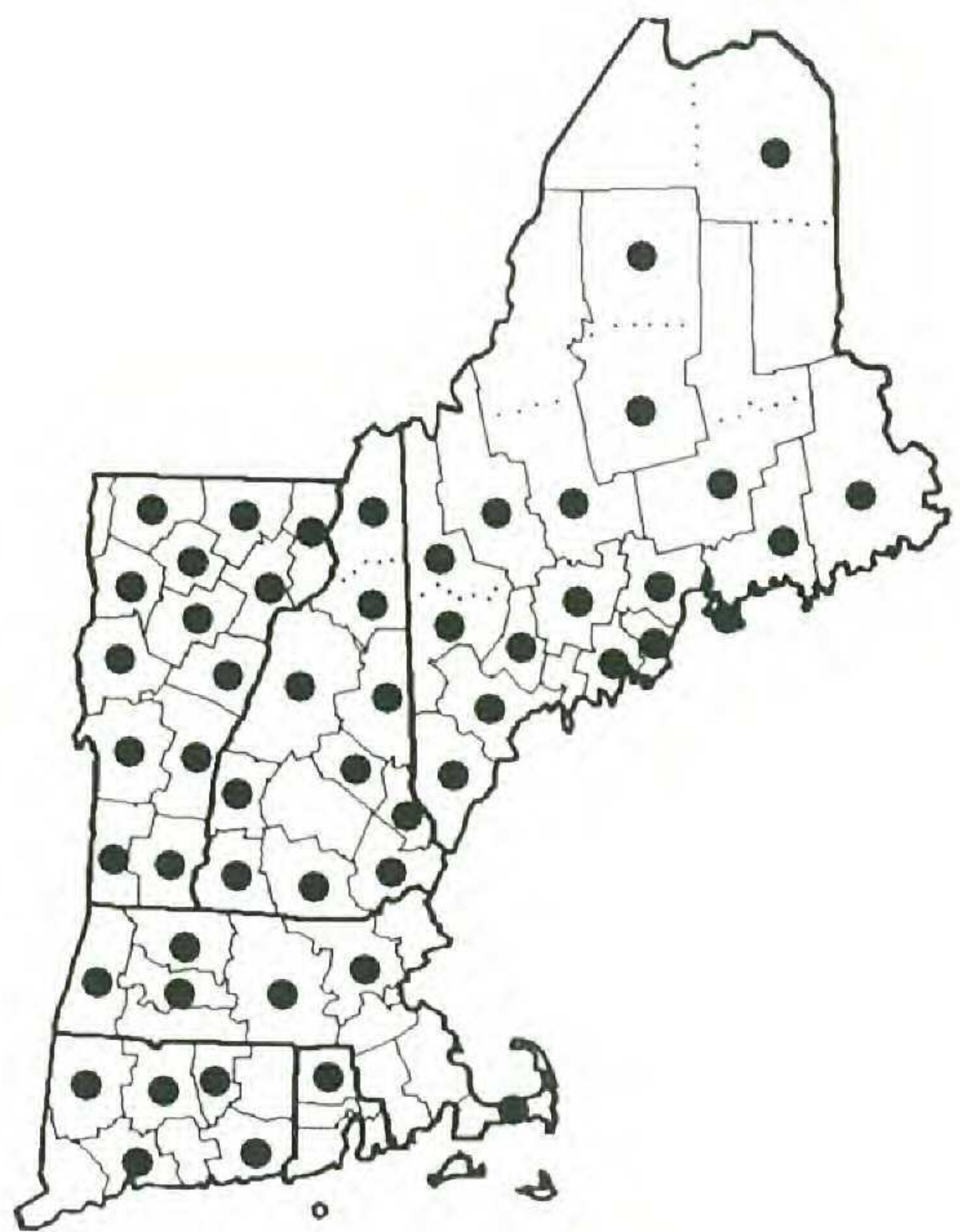


Juniperus horizontalis
 $\times$ *J. virginiana*

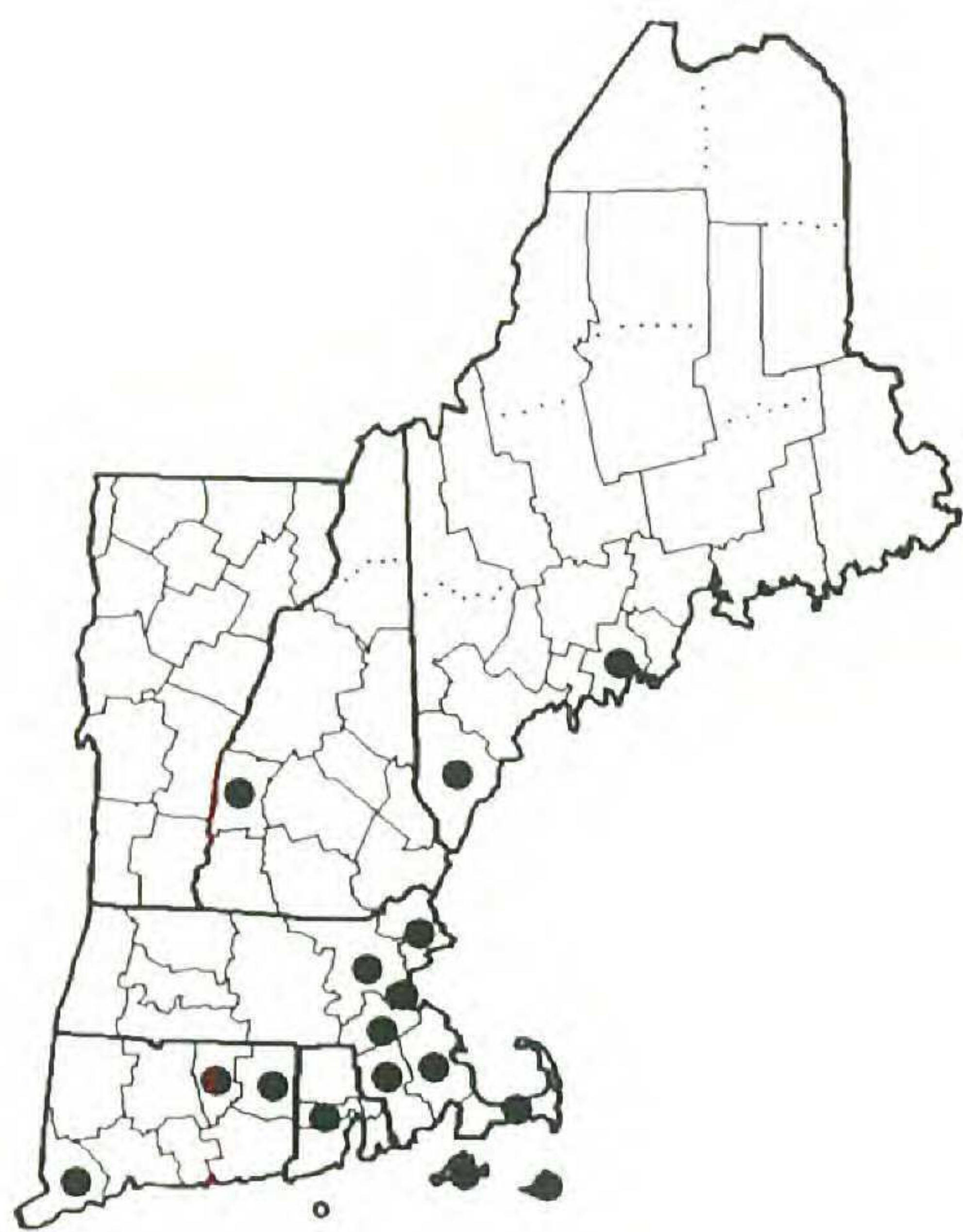
Figure 39. Distribution maps for *Juniperus horizontalis*, *J. virginiana*, *J. communis* var. *depressa* $\times$ *J. virginiana*, and *J. horizontalis* $\times$ *J. virginiana*.



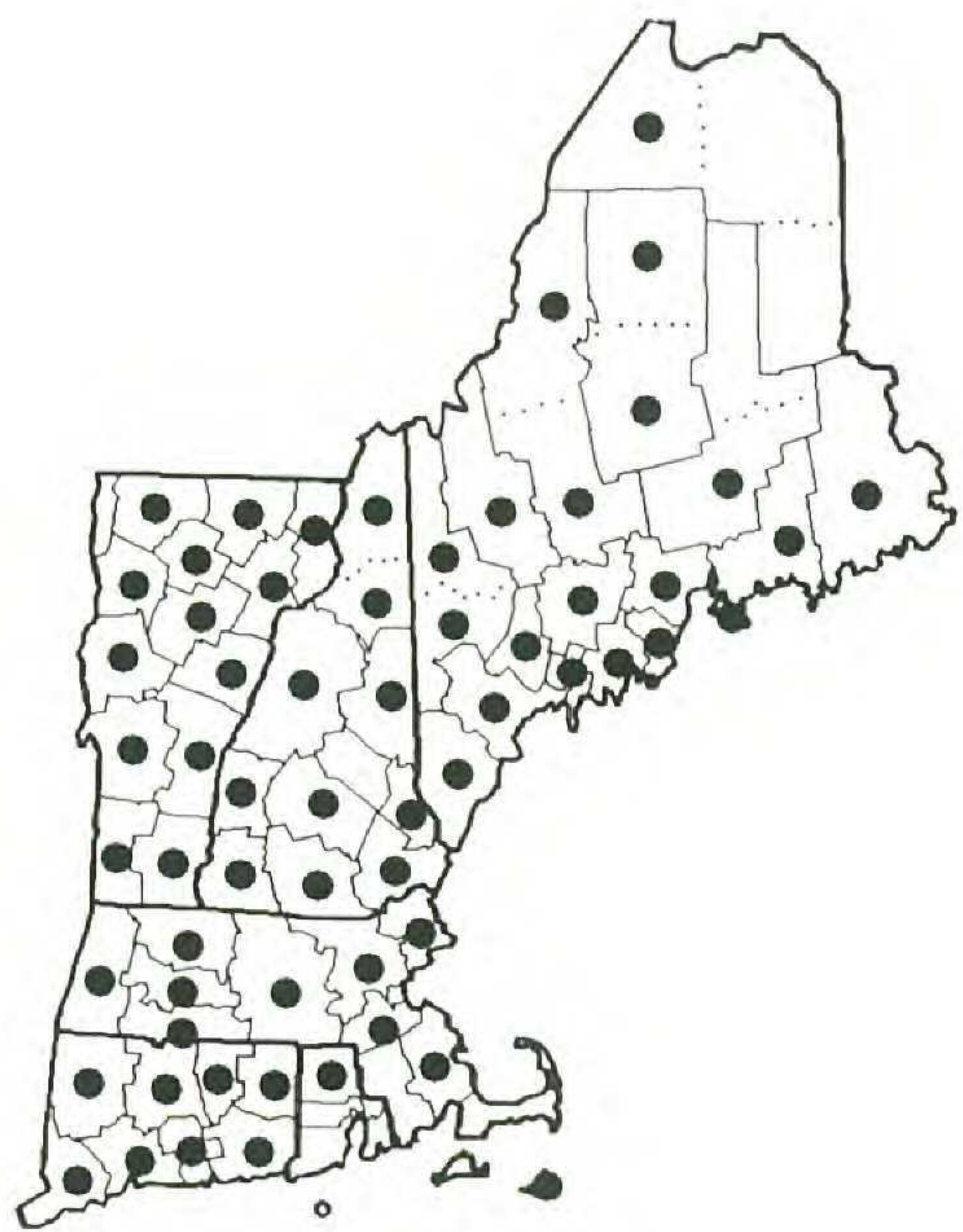
Thuja occidentalis



Abies balsamea



LARIX DECIDUA



Larix laricina

Figure 40. Distribution maps for *Thuja occidentalis*, *Abies balsamea*, *LARIX DECIDUA*, and *L. laricina*.

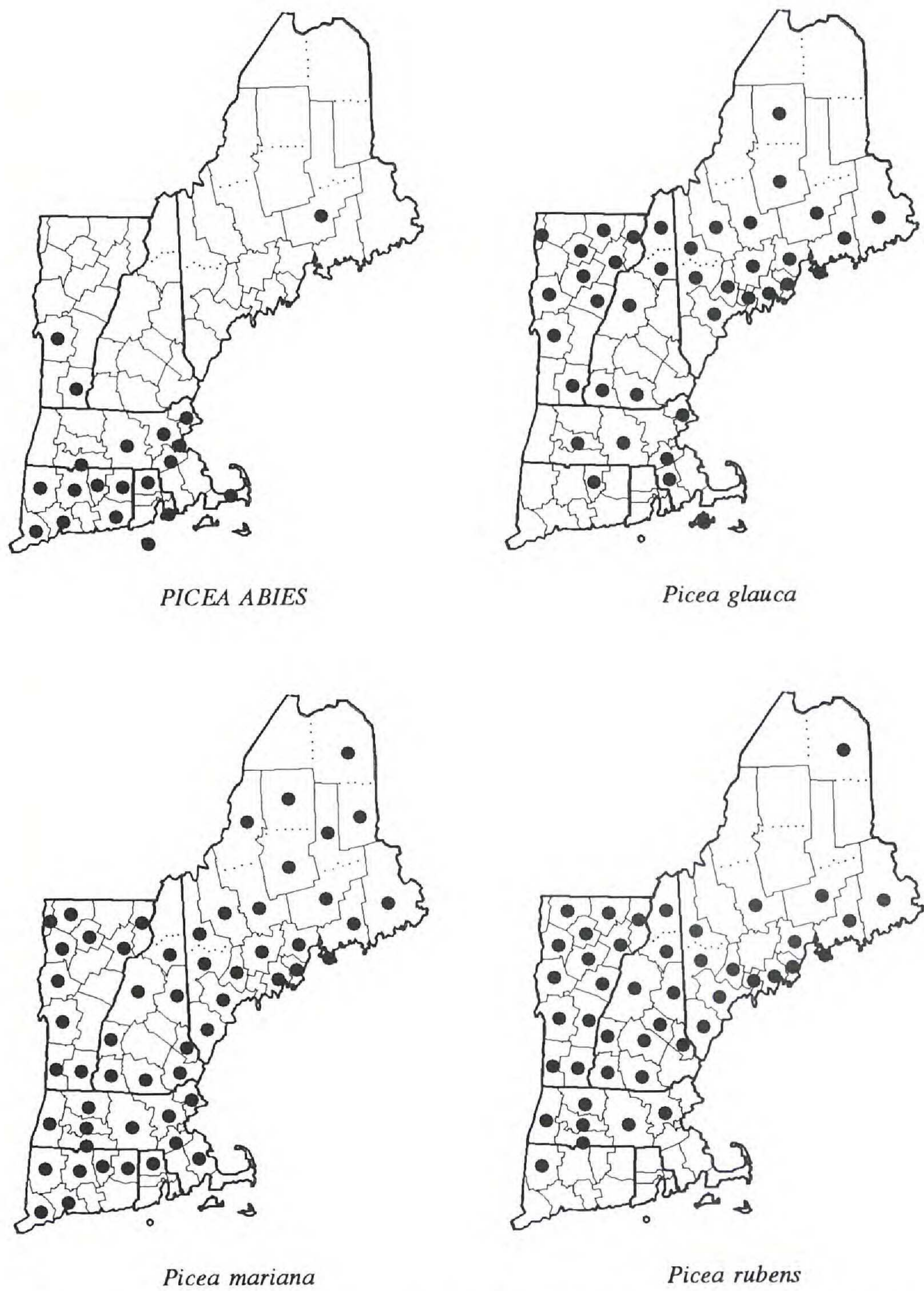
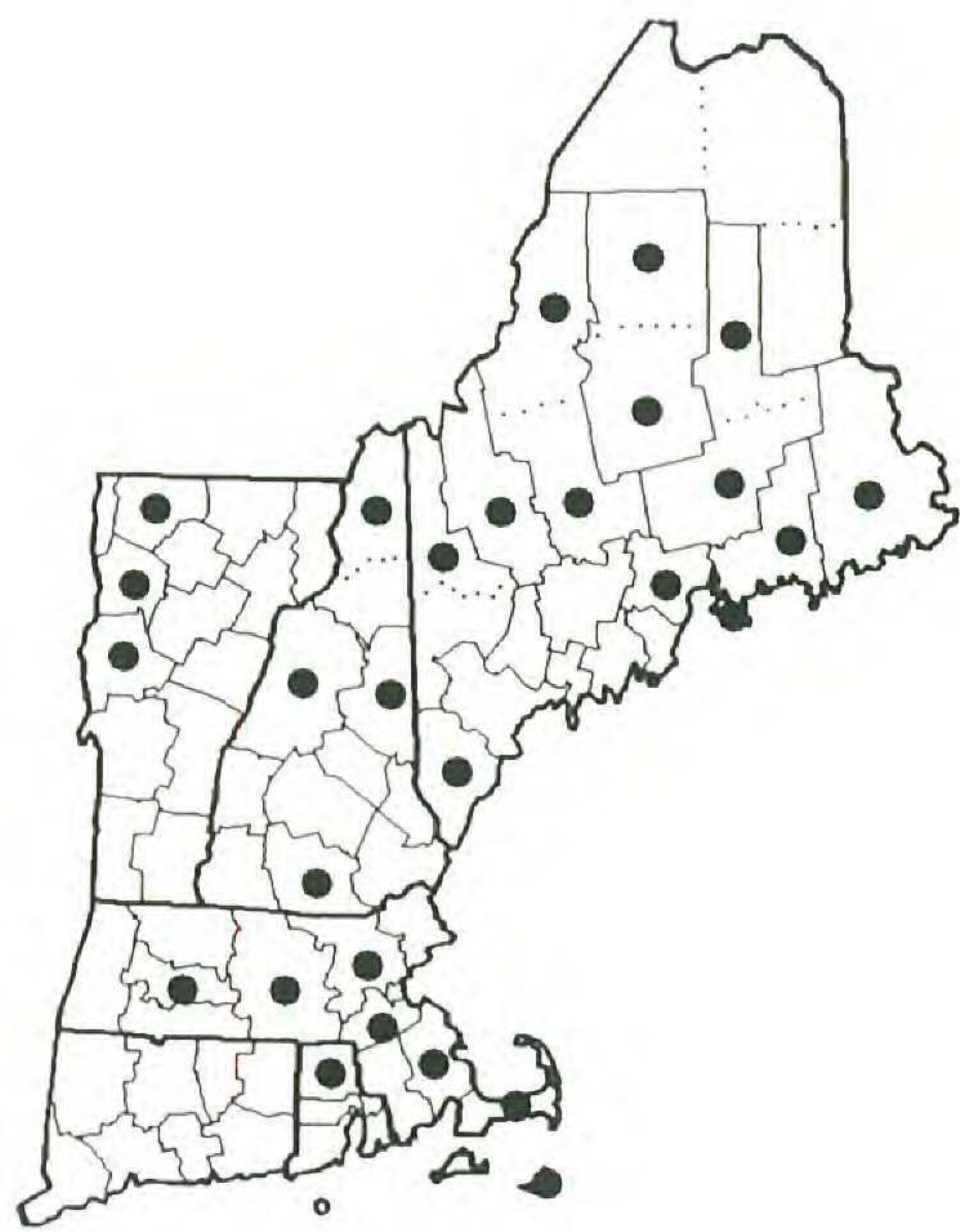


Figure 41. Distribution maps for *PICEA ABIES*, *P. glauca*, *P. mariana*, and *P. rubens*.



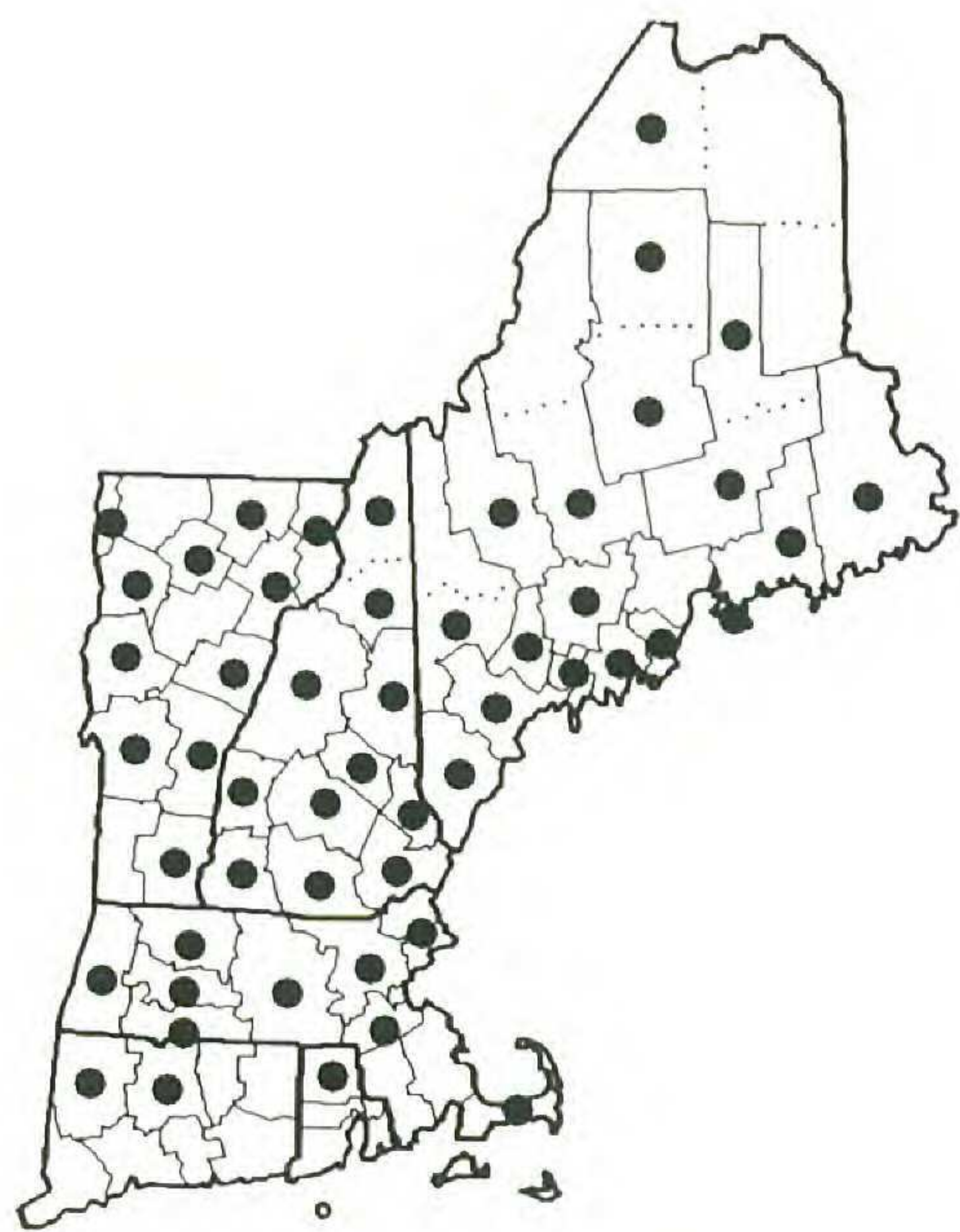
Pinus banksiana



PINUS MUGO



PINUS NIGRA



Pinus resinosa

Figure 42. Distribution maps for *Pinus banksiana*, *P. MUGO*, *P. NIGRA*, and *P. resinosa*.

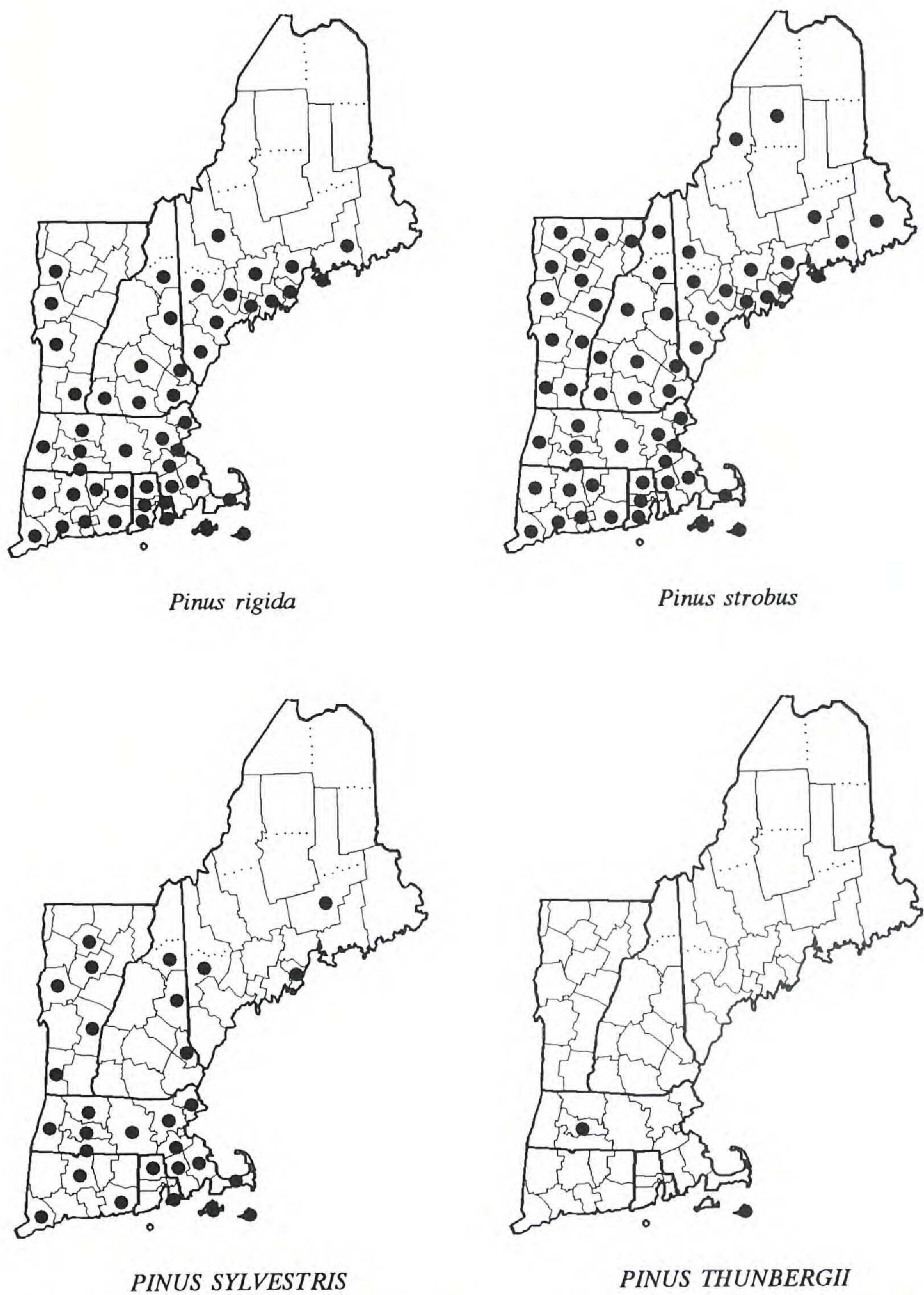
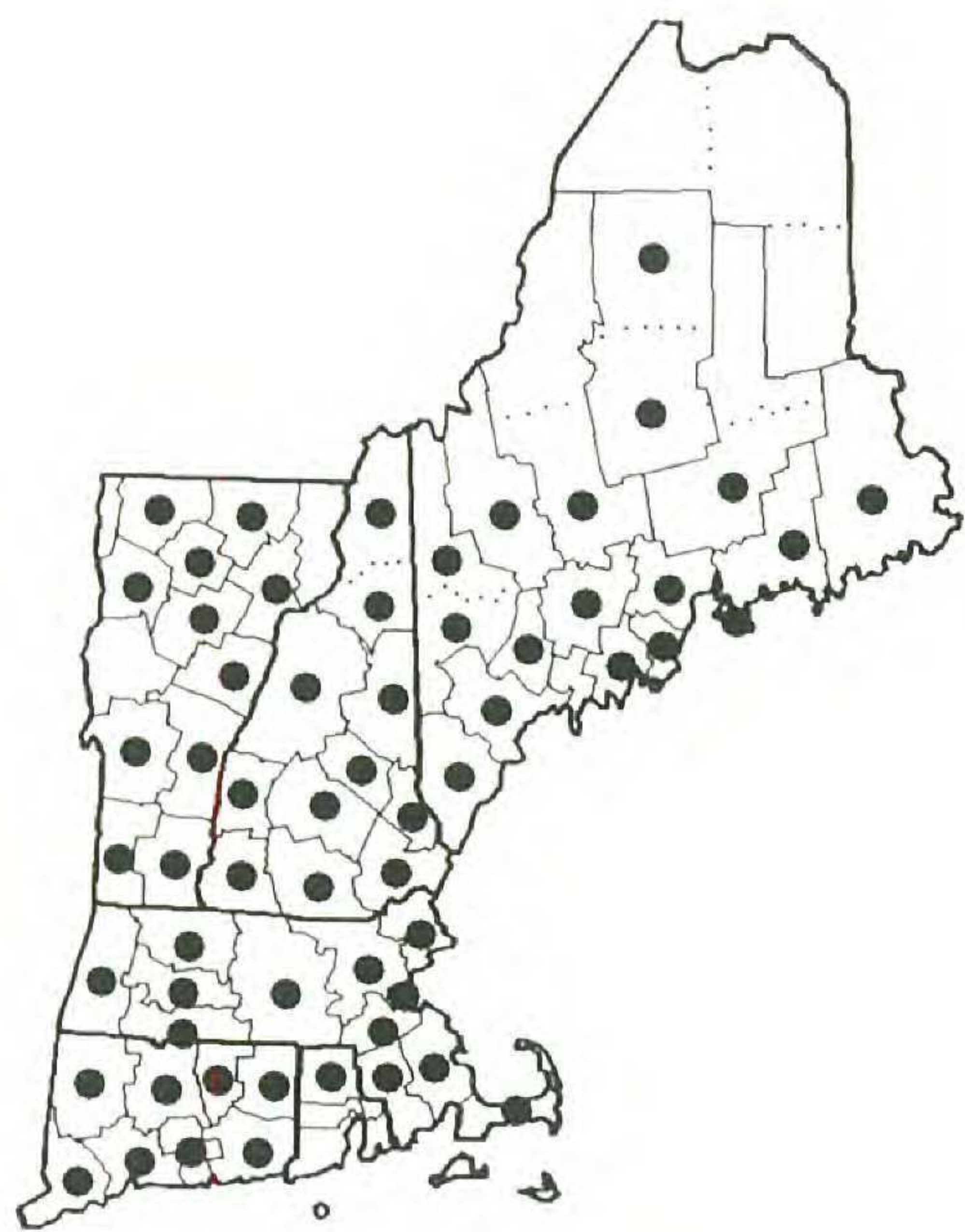
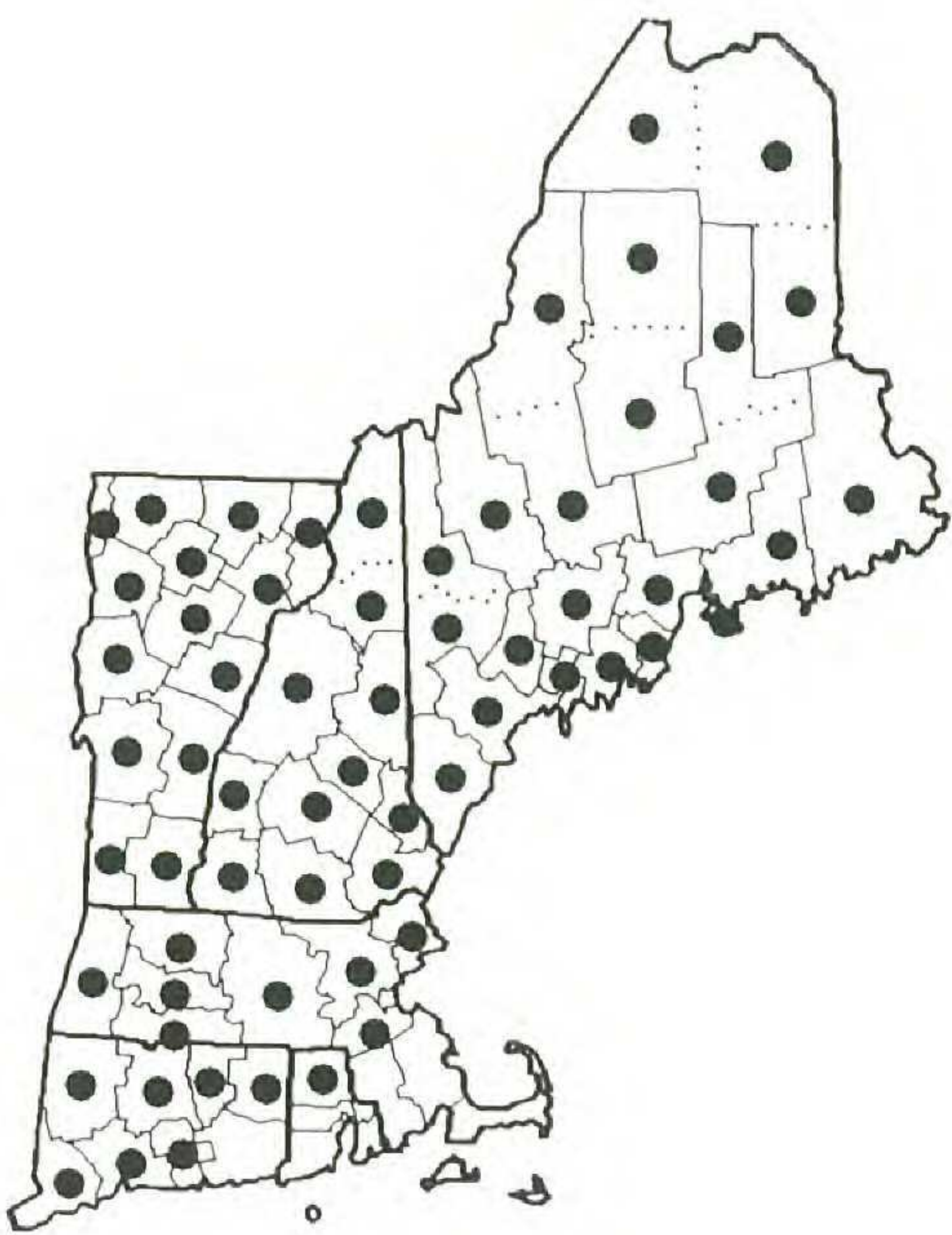


Figure 43. Distribution maps for *Pinus rigida*, *P. strobus*, *P. SYLVESTRIS*, and *P. THUNBERGII*.



Tsuga canadensis



Taxus canadensis



TAXUS CUSPIDATA

Figure 44. Distribution maps for *Tsuga canadensis*, *Taxus canadensis*, and *T. CUSPIDATA*.

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